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Arboretum bulletin

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Cover Photo:

Trunk of western yellow pine *(Pinus Ponderosa)*.

Photo by B. O. Mulligan

An Appraisal of Small Ornamental Trees in the Garden

LYN DAVIS*

IF YOU choose to design your garden without professional landscape advice, it can be a stimulating and highly enjoyable challenge; the mistakes you make through a lack of foresight, and the successes you achieve mainly through luck, are all your own! For other gardeners who may choose this uncertain but rewarding path, here is an appraisal of the small, ornamental trees we've planted in the garden during the past fourteen years, with information on their performance under specific garden conditions.

Since hardiness qualities are occasionally mentioned, we should add that our location is half a mile east of Lake Washington—neither in a frost pocket nor an especially protected situation. The level, open lot has been divided into a series of outdoor rooms, permitting a more varied use of plant material than would be possible in a single, open area.

Deciduous Trees

Listed below are twelve small ornamental trees that are deciduous. Since there is a wealth of color from flowering shrubs in the spring, most of the trees were selected to add interest to the garden during the other nine months of the year. The first six trees are familiar to most gardeners; the following group is less often used in landscaping.

Oxydendrum arboreum — the sorrel tree. This appears to be a slow growing shrub for its first few years in the garden, and then suddenly sends up 2- to 3-ft. upright shoots and thereafter continues to grow at a rapid pace. Mistakenly planted beneath an 8-ft. roof overhang ten years ago, the *Oxyendrum* pictured here has shot vigorously skyward, bending out to the sun to a height of 12 ft. and 8 ft. in width (fig. 13).

This specimen has done well in heavy clay soil (though well-drained soil is usually recommended), and its fibrous roots haven't grown into adjacent plantings of dwarf rhododendrons and heather in improved soil. The foliage makes such a brilliant display when it turns scarlet in autumn, that we have it spotlighted at night. Because of outgrowing its site, however, this tree will be moved to another location this winter.

Rhus typhina — the staghorn sumac is as colorful as the *Oxydendrum* in the autumn, with its red-orange-yellow feathery, pinnate foliage, but the color doesn't last as long. When the leaves do fall, a strong, dramatic, horizontal-branching structure is revealed.

Used in a front entrance planting along with other "dry" growing shrubs such as Mugho pine, 'Springwood White' heather, Oregon grape, and the shrubby, evergreen *Quercus Sadleriana,* it has been an entirely satisfactory accent tree, spreading horizontally with growth about a foot a year. The leafy sprouts that spring up from the roots of this tree are easy to control in this location.

Prunus subhirtella autumnalis — The autumn flowering cherry is often mentioned as a "must" in Northwest gardens because of its winter-flowering characteristic. In the garden this tree is planted in a raised bed of rhododendrons. The light shade it throws and its moderate growing habit make it a good choice for the site, but the delicate off-season flowers are lost to us. The upper branches of the cherry, as seen from the house, are silhouetted against a bright southwest sky. In this exposure, the tree needs an evergreen background so the flowers can be seen.

In rich, well-drained soil, this tree has attained 16 ft. in height and 18 ft. in width since it was planted as a four-year-old tree in 1953. It has been increasingly difficult to

*Mrs. (Donald C.) Davis, of Bellevue, Washington, writes from personal experience in growing these trees.

Editor's Note—Examples of most of these trees can be seen in the Arboretum, either along Arboretum Drive East *(Oxydendrum, Cercidiphyllum, Rhus, Umbellularia, Cornus, Quercus suber, Styrax Obassia, Franklinia, Stuartia),* or on Azalea Way (the two *Prunus* and *Styrax japonica).*

keep the soil beneath it moist enough for flowering evergreen shrubs, and several have been lost because of a large tree root a few inches beneath the soil surface. The rule of watering deeply would help here.

Prunus yedoensis — the Yoshino cherry. In contrast with the above cherry, this tree is very fast growing, has heavier foliage and far-flung, arching branches that are covered with single, pale-pink blooms in a sudden and brief burst of color. It is the focal point of a long garden vista, and is enhanced by a background of hemlock and white pine. Various pink- and blue-flowered rhododendrons bloom with the cherry, making a memorable picture in early spring.

A recent addition to the garden, the Yoshino cherry has caught up with older trees in only four years, and is now 15 ft. tall and almost as wide, growing in light clay. To date, there has been no root problem.

Cornus florida var. *rubra* — the familiar pink flowering dogwood has been wholly satisfactory in vigor of growth, flowering and fall color, and has plenty of room to grow for another decade in the garden. The only regret is that another species of dogwood wasn't used — *Cornus Kousa* — but only because our tastes have changed.

Growing in an open, sunny location in heavy clay, with the roots shaded by *Pernettya,* Oregon grape, and a large Mugho pine, it has reached 14 ft. in height and is spreading to 10 ft. The tree is about fifteen years old. The planting is self-supporting and no summer watering has been required.

Below

Oxydendrum arboreum **flowering in Mrs. D. Davis' garden, Bellevue, Wash.**

FIG. 13 PHOTO BY MRS. DAVIS

Acer palmatum — The Japanese maple has been a source of continuous enjoyment every season of the year, used as a patio tree close to living room windows. In fifteen years in the garden, it has grown to 18 ft. tall and 10 ft. wide, and the roots haven't damaged dwarf rhododendron plantings beneath it.

Franklinia alatamaha—for five or six years this graceful, small tree with ascending branches gave us a good deal of pleasure. Planted in rich soil in full sun with a dependable water supply in summer, it grew rapidly, the narrow lustrous leaves were healthy and plentiful and clung tenaciously to the tree through autumn windstorms even after they had turned to orange-scarlet shades. The creamy white, single flowers in October were particularly striking against the colorful foliage.

Unfortunately, a grouping of camellias, planted three feet from the base of the tree, have proved to be too competitive. This year there were no flowers on the *Franklinia,* the foliage was sparse, and the tree is ineffective as a landscape subject—after twelve years in the garden! At least one of the camellias will be removed this winter, and additional food and water will be provided next year. Under the present conditions, the tree, at fifteen years, is 11 ft. tall and 4½ ft. wide.

Cercidiphyllum japonicum — Perhaps the most successful deciduous tree planting in the garden is a grouping of three Katsura trees. Their rapid rate of growth really takes them out of the small tree category, at least here. Planted in their permanent position six years ago, when about four years old, they are 18-20 ft. tall, and about 12 ft. wide. The soil is fairly heavy clay, the trees receive moderate moisture in the summer, and are located in the open with some morning shade at the base. The roots are invasive, stringy, surface-rooting, and travel some distance from the trunk.

The beauty of the Katsura tree lies in its one- to three-inch rounded leaves which are reddish when unfolding, a clear apple-green when full out, and then attaining their height of beauty in the fall, turning gold and apricot shades. The intensity and range of color varies in the three trees. The leaf of the *Epimedium* is similar in shape and color in the spring and summer, and this is used as a partial ground cover along with *Linnaea borealis.*

Last October a definite, fruity fragrance, such as from ripe apples, was traced to the bright leaves of the *Cercidiphyllum.* It was particularly pronounced on warm days after a heavy dew.

Stuartia pseudo-camellia — This choice tree from Japan and China is planted near a window where we can thoroughly enjoy its distinctive beauty throughout the year. It has special interest in three seasons: in the fall the foliage turns rosy-red; in winter the graceful habit of growth and delicate zig-zag branching structure catch the eye; and in July the white, crinkly flowers appear. The flowering thus far, on our nine-year-old tree, has been sparing, but this should improve as the tree matures.

Planted in full sun, the tree has three stiffly-upright leaders from a three-inch trunk, reaching 11 ft. in height, and side branches spreading almost half as wide. When background shrubs grow large enough to shade the base of the tree, it will be easier to keep the compact surface roots damp in the summer, a condition it prefers.

Magnolia Sieboldii (parviflora) — This late spring and summer-flowering magnolia has little to recommend it for seven months of the year, with its rather shrubby, almost viny branching structure, but the beauty of its simple two- to six-inch leaves, and its elegant, strongly fragrant white flowers that begin to open when the leaves unfold, make it a desirable tree for a garden area used in the summer. Our thirteen-year-old tree is planted in a secluded bedroom patio — a favorite retreat where we like to sit in the sun and marvel at the seemingly endless array of flowers and newly-formed buds promising future bloom.

A fence shades the magnolia roots, and helps keep the ground moist. Under these conditions and in good soil, it has grown to

a height of 12 ft. and is almost as wide. Judicious thinning is necessary on the lower portion of the tree. Magnolias resent root damage, and their fleshy surface roots spread out rapidly from the tree, limiting the use of accompanying plant material.

Styrax japonica — Grown in the open, this species forms a thickly-leaved pyramid with a sturdy, single trunk. We planted a four-year-old tree in 1953 to shade a patio, thinking it could be trained up so that foot traffic could pass under it when the tree was large. The *Styrax* has grown to 16 ft. and the lower branches are as wide. Since shade is no longer needed, and pruning has resulted in an awkward-shaped tree, it will have to be removed.

Here, in the full sun, the *Styrax* is heavily laden with small, waxy, white flowers in June; the tree fairly vibrates with the buzzing of bees at this time. The invasive surface roots make it impossible to plant shrubs near it—we tried! The tree self-seeds freely and we have numerous seedlings growing in various parts of the garden. One, growing in partial shade, is forming a much more graceful shape.

Styrax Obassia — Planted at the same time as *S. japonica,* this species is just as tall with a narrower spread of 9 ft. It was planted in rich soil in a raised bed, at the junction of a fence and hedge, and serves a two-fold purpose, breaking the horizontal lines in the background, and screening a distant telephone pole.

With a cool, shaded root-run, the *Styrax* roots have not affected rhododendrons in the foreground. The large rounded leaves turn yellow in the autumn.

Evergreen Trees

When we first started gardening in the Northwest, the only oak trees we knew were the evergreen oaks with holly-like leaves. It came as a distinct surprise to find that there were also deciduous varieties! Since then, we've come to appreciate oaks of all kinds, but our primary interest has been in the evergreen varieties, and we've developed a collection in the garden.

We feel that it is essential to grow these trees "dry" in the Northwest to ensure their early fall dormancy and consequent hardiness in winter, and to prevent the formation of bushy, thick-foliaged branches. The late Clarence Prentice, of the Prentice Nursery and Decorating Co., once said that the top-heavy, evergreen oaks were susceptible to wind damage in the Seattle area, and this limited their landscape use.

Following is a report on three oaks that are large enough to judge their value in landscaping. Two other evergreen trees that we've enjoyed growing also are listed below; one a West Coast native, the other from Chile.

Quercus suber — the cork oak from southern Europe. It has been a constant pleasure to watch this develop from a young plant into a highly ornamental tree. Its most distinctive feature is the spongy, deeply-furrowed, gray and cinnamon-colored bark on its single trunk, set off nicely by the prickly, gray-green foliage. Planted ten years ago when it was a three-year-old plant, the oak is now 12 ft. tall and about half as wide.

Mindful of its native habitat, we originally planted this tree in well-drained soil in the corner of a nursery bed in full sun with reflected heat from a fence north of it. When it became old enough to be of landscape value, a new fence was put in south of the tree, permitting the oak to be seen from an entrance walk. The landscape effect is pleasing, but the growth has been more vigorous with partial shade, and possibly more susceptible to frost damage.

Quercus agrifolia — The Coast Live Oak, from the mild coastal regions of California, is less inclined to form a single trunk, and a young plant should be pruned to attain the shape one wishes. Our tree was raised from seed planted in 1950. It died back to the ground in the 1955 freeze (which didn't injure the cork oak), and sent up a thicket of shoots the next spring. Out of this jumble we managed to encourage a main leader, with several low branches. The leader which is now a rigid, light-gray trunk, arches over a path, with the side branches balancing in

(Continued on page 125)

Dwarf Conifers in Strybing Arboretum

ARTHUR L. MENZIES*

STRYBING ARBORETUM is fortunate in having one of the finest collections of dwarf conifers to be found in any public garden in the western United States. This collection, known as the "James Noble Conifer Collection," was officially dedicated and accepted by the City and County of San Francisco on December 3, 1960. The collection, presented to us by Effie V. Noble in memory of her late husband, represents over thirty years of dedicated labor during which time Mr. Noble and his wife patiently gathered together these little plants from nearly every corner of the earth.

The collection consists of some 372 species, varieties and cultivars of dwarf and slow growing conifers. These are all natural forms and are not to be confused with the artificially trained bonsai specimens of the Japanese which are now so popular. These plants will grow slowly year by year in the open ground, and will not revert to normal arborescent trees. They are of many different shapes: conical specimens, freakish abnormal branched types, prostrate mats, bun-shaped bushes and rounded balls. Perhaps the two outstanding groups represented in our planting are some thirty forms of the Lawson cypress, *Chamaecyparis Lawsoniana,* and twenty-four forms of the Hinoki cypress, *Chamaecyparis obtusa.* Amongst the latter are minute ball-shaped plants some thirty to forty years of age.

Many methods were employed in the gathering together of this collection. Nearly every year, Mr. Noble and his wife searched the mountains of California looking for unusual plants. A few of the choicest were obtained by climbing the forested mountain slopes and combing the rocky outcrops near timberline. He spent many hours walking the rows of field plantings of some of the larger wholesale growers, keeping an alert eye open for something new or different. In one nursery he found what is perhaps the rarest dwarf in the world, a *Cedrus deodara* 'Pygmaea.' This seedling mutation, now some 20 to 25 years of age, is only sixteen inches high and has a 24-inch spread. Unfortunately for us, this magnificent little plant was given to Mr. William T. Gotelli in South Orange, New Jersey. Recently his collection, one of the most complete in the world, was donated to the National Arboretum in Washington, D. C. Only one graft from this plant was successfully propagated and this was sent to Mr. Noble's friend, Mr. A. H. Nisbet of Gosport, England. We hope that someday this plant can be more easily increased and will be made available to others. It was through Mr. Nisbet that some of the newest and finest forms were acquired. During Mr. Noble's European trip, he visited Mr. Nisbet's garden in southern England and found there an outstanding collection. The enthusiasm for conifers which both of these collectors so ardently shared resulted in an exchange of rare material which greatly enhanced each collection.

These plants have been placed in the Arboretum at the site of the old rock garden, in an area of about one acre and a half. The site is a southern facing slope bordered on the west by a windbreak of Monterey cypress and Monterey pine some sixty years of age. To the east is a small lake connected by a wee stream to another lake near the center of the site. At certain times of the day interesting reflections of some of the conifers are to be seen in the water. Rock work has been kept to a minimum, but a few bold outcroppings have been made. A large specimen of *Pinus densiflora* 'Pendula' has been planted high upon one of these outcroppings and flows down nearly to the water's edge. It must be kept in mind that these prostrate forms, while low in stature, are by no means dwarf in spread and sufficient space had to be given at the time of planting to enable them to increase in breadth and beauty (fig. 15).

*Supervisor of Plant Accessions, Strybing Arboretum, Golden Gate Park, San Francisco.

For the convenience of the public interested in these plants, we have grouped them more or less as to variety. For aesthetic reasons, many of the golden forms of the Lawson and Hinoki cypress also were planted together. The collection has been interplanted with rock plants which are not only fitting companions but which add color and interest in the different seasons of the year. The planting still has somewhat of a bare look, but it is our hope that when the rock plants increase in size enough to intermingle and hide most of the harsh soil, a more natural and mature effect will be achieved (fig. 14).

With few exceptions most of these plants are perfectly hardy. During January of this year the lowest temperature recorded was 22° F., and if anything the cold snap increased the winter colors that many of these plants take on. The lovely plum shades of some of the *Chamaecyparis pisifera* cultivars accentuated the yellows of other plants and the soft browns of some of the thujas. We have noted that the variegated and golden forms of a few cultivars do have a tendency to windburn and sunburn. During the summer months, our early morning fogs cover the plants with thousands of drops of dew that sparkle like diamonds when the sun breaks through in late morning. These droplets seem to act as magnifying glasses on the golden forms and occasionally seriously burn the foliage. By necessity our plantings must be watered by overhead sprinklers, and we try not to do this during the hottest part of the day.

Although the insects and diseases which attack dwarf conifers are probably no more prevalent than those which attack other garden plants, certain sanitary measures are necessary. We have found that a twice yearly spray program carried out during the dormant season in February and again after the flush of new growth has hardened off in early August, usually is sufficient to control most insect pests. The cypress moths, *Argyresthia cupressella* and *A. franciscella,* are common on the Monterey cypress widely used as wind

Below

Dwarf conifer collection (Noble) in Strybing Arboretum, Golden Gate Park, San Francisco.
FIG. 14 PHOTO BY B. O. MULLIGAN, AUG. 7, 1962

barriers throughout Golden Gate Park, and the caterpillars of this minute moth infest the tips of the twigs of many forms of the Lawson and Hinoki cypress. They mine the leaflets, causing them to die and fall. Webbing often accompanies the work, and pupation occurs in small white cocoons either inside the burrows or attached outside to the twigs.

The common red spider, *Tetranychus telarius,* is the most destructive red spider in the western states, but with our conifers seems to confine its attack to the dwarf forms of the Norway spruce. The adults usually appear in May and June and their destructive work soon becomes evident. They puncture and drain the epidermal cells of the plants, first causing a yellowing and finally a complete destruction of the tissues so as to drop the leaves.

Aphides of several species are common pests and seem most frequently to attack the firs, spruces and junipers. Some of the small green aphides are hard to see, and the dwarf Alberta spruce, *Picea glauca* var. *conica,* is one of their favorite hosts. Unless carefully watched for, this aphid will cause a premature dropping of the foliage that seriously weakens the plant. Whenever you see numerous yellow jackets hovering about the conifers, you can be sure that aphides are there and are being "milked" of their honeydew.

Our spray program usually consists of a combination of 50% wettable DDT powder and Malathon. With us the DDT is a necessity to control the cypress moths, but unhappily its continued use builds up the red spider population by the consequent destruction of insects predaceous upon the mite. When this happens, one of the newer miticides is used.

During the past few years the fungus diseases *Rhizoctonia* and *Phytophthora* have caused some losses among our junipers and dwarf forms of the Lawson cypress. *Rhizoctonia* originates near the soil surface rather than at the root tips as is the case of the water mold *Phytophthora.* Both of these diseases can be spread by rain or overhead watering, scattering bits of infected soil to nearby uninfected plantings. The control of these diseases is not easy, but they can be suppressed by making the environment as unfavorable as possible. Helpful measures in controlling the diseases are the removal and burning of infected plants, the reducing of watering without unduly checking the growth of the remaining plants, and by the use of fungistatic drenches such as PCNB, or even fungicides having a poor soil penetration such as Arasan or Captan.

Among some of the more interesting plants are the following:

Abies Fraseri 'Prostrata,' a low depressed plant with wide spreading branches. This plant was found in a Massachusetts nursery about 50 years ago among a batch of seedlings of *A. Fraseri* received from a nursery in France.

Chamaecyparis Lawsoniana 'Nana Argentea,' a small bush having ascending branchlets pressed tightly against one another. The tips are all pendulous or recurving. The older foliage is grey-green and the new foliage tipped silvery-white.

C. Lawsoniana 'Minima Aurea', a seedling originating in the nursery of Messrs. Rogers, Southampton, England; a golden-leaved, upright dwarf form with the branchlet sprays set edgeways. This slow growing plant retains its bright foliage color all year.

(Continued on page 124)

Below
Pinus densiflora pendula.
FIG. 15 PHOTO BY P. H. BRYDON

Plant Collections in The University of Washington Arboretum

INTRODUCTION

This list was compiled for a symposium on special plant collections, at the annual meeting of the American Association of Botanical Gardens and Arboretums, which took place at St. Louis, Mo., October 12, 1963. It was thought worthy of wider publicity in the pages of our BULLETIN.

There are now ten major and six minor collections of woody plants in this Arboretum, as follows:

A. *The Major Collections*

1. *Acer* Maples

Species and botanical varieties grown number sixty nine; clones and hybrids sixty eight; total 137 kinds.

An importation of Japanese plants in 1940 and 1941 formed the nucleus around which a very representative collection of species from all temperate regions of the world has been built. Several species new to cultivation in the United States have been added here since the check list of maples in cultivation was published by the A.A.B.G.A. in August 1958; e.g. *A. distylum* S. & Z., *A. Giraldii* Pax, and *A. rubescens* Hayata.

One evergreen species is grown, namely *A. oblongum* Wall. ex D.C. but has not yet flowered.

2. *Camellia*

About 200 clones of *C. japonica,* ten of *C. Sasanqua* and twelve of *C. X. Williamsii* (or other hybrids of *C. saluenensis,* are cultivated.

In addition we grow the species *C. cuspidata, C. oleifera, C. reticulata, C. saluenensis* and *C. sinensis* outdoors. The Chinese clones of *C. reticulata* have to be wintered in a cool greenhouse; likewise *C. hongkongensis.*

The collection is located on well-drained, sandy soil in the upper part of the Arboretum, is mulched annually with partly rotted leaves and is thriving.

3. *Cistus* (including *Halimium*)

The entire collection, excepting *C. Atchleyi* and *C. laurifolius,* was killed by the early freeze experienced in November 1955, but has since been replaced.

Twenty eight species, varieties or hybrids are now grown in an exposed site facing south, on sandy soil. Cuttings of the best are generally rooted each fall and kept in a cool greenhouse over the winter as a precaution, but most of those we grow are hardy in Seattle in a suitable situation.

4. *Ilex* Holly

A collection of clones of *I. Aquifolium, I. opaca* and *I. crenata,* together with some other species, was first planted in 1948.

At present we possess eighty-nine clones of these three species, with forty other species, varieties or hybrids.

The following are not dependably hardy here: *I. Cassine, I. cornuta, I. insignis, I. rotunda,* and *I. vomitoria 'Xanthocarpa.'*

One old plant (of 1941 origin) remains of *I. chinensis,* but has not yet flowered, though now 20 ft. tall.

5. *Magnolia*

Twenty nine species and twenty six hybrids or clones are being grown, generally successfully. The least hardy is the beautiful *M. Campbellii,* from the Himalaya mountains, but a fresh stock has now been obtained from England which should be hardier.

The evergreen *M. Schiedeana* from N-E. Mexico, introduced by Dr. F. G. Meyer in 1948, is still with us, but grows slowly and has not yet bloomed. Two clones have been named and introduced in recent years, namely *M. Kobus* 'Wada's Memory' and *M. salicifolia* 'Else Frye'; both are much superior to the normal types of these species.

6. *Quercus* Oaks

About seventy species or varieties and two or three hybrids are established here. Many of the plants date back to 1937 or 1938 seeds, from the Arnold Arboretum or

elsewhere.

More than a dozen are evergreen species, including the cork oak *(Q. suber)* from southern Europe and the Asiatic *Q. glauca* and *Q. myrsinaefolia*. *Q. vaccinii-folia* from the Siskiyou Mountains of southern Oregon flourishes on the rock garden.

7. *Pinus* Pines

The first Pinetum was planted 1937-1940, but about one-half of it is expected to be lost when the Thomson expressway is constructed along the west side of the Arboretum during 1964-1965. A group of *Pinus Coulteri* 40-50 ft. tall now forms a prominent feature there and may be saved.

Newer plantings have been made in two other locations, one on the steep east bank of Azalea Way, the other on Foster's Island at the north end of the Arboretum; both seem successful. The total number now grown approximates fifty seven species and varieties, with thirteen clones and hybrids. A number of the latter from the Institute of Forest Genetics at Placerville, California are well established, but we lack *P. X. Holfordiana*.

Young plants of the Mexican species *P. Greggii, P. Montezumae,* and *P. patula,* of *P. Gerardiana* from the N.-W. Himalaya, and of *P. Massoniana* from eastern China are being tried.

8. *Rhododendron* (including *Azalea*)

One of the oldest and certainly the largest in point of numbers of our collections, the first plantings having been made in 1941.

Although many plants were killed by the cold weather in November 1955 most kinds have been replaced and the area used gradually extended.

There are now over 300 species and 175 named hybrids growing here, plus large numbers of unnamed hybrids of our own and others raising, for future evaluation. Most of the smaller types are grown in permanent beds in a lath house. Large-leaved species of the *Grande* and *Falconeri* series were entirely eliminated by cold in 1955 but are again being grown in some variety, though our relatively low summer rainfall (average for May through August, 4.25 in.) and humidity is not to their liking.

Of Azaleas we have about 200 clones, many of them from Glenn Dale, but with good representation of most other hybrid races.

The flowering season of rhododendrons in Seattle extends from January or February to August.

9. *Sorbus* Mountain Ashes

This has been a recent development, the first plantings having been made in 1950, but removed in 1961-62 to make way for the second Lake Washington bridge, after a decade of excellent growth on a former city dump site.

Another, less suitable area is now in use for this genus, of which we have accumulated thirty nine species and varieties, seven hybrids and one clone. Since most of the species were grown from seeds received from botanic gardens, arboreta or nurseries in Europe many hybrids have appeared amongst the progeny, generally of lesser horticultural value. Seeds or living material from wild sources would be most desirable but are seldom available.

This group, in all its variety, has considerable potential value for streets, parks and gardens in this region and needs promotion.

10. *Viburnum*

The majority of these were set out between 1953 and 1955 but additions have been made in most subsequent years.

The soil conditions of the principal site are not the most desirable; some of the less hardy evergreen species *(V. odoratissimum, V. cylindricum)* are placed in a warmer and more sheltered situation. *V. Tinus* is entirely hardy here and makes an admirable informal hedge; some of its variants are much less so.

Total species and varieties, forty one; hybrids and clones, twenty four.

B. *The Minor Collections*

11. *Alnus* Alders

Growing on Foster's Island and in a low, damp area adjacent to Lake Washington

(Continued on page 128)

Tree and Shrub Pruning

ROGER ROBERTSON*

TREE PRUNING is done for several reasons; first, the health of the tree, second, its appearance and safety. The quality of any tree is realized more thoroughly by proper care. For although a tree is looked upon as an object that requires little care, it obtains its potential value by the proper care of man.

This care involves trimming and pruning which can be done at any time of the year on most trees, although the most favorable period is between February and May, just before the new growth starts, when healing is rapid by new callus growth.†

SHADE TREES. Start by studying the shape of your tree. Then remove all dead and diseased wood and crossing limbs. Now some limbs that may be crossed will, if removed, leave large holes in the canopy of your tree or make it lopsided. If you have this problem, the best thing to do is bolt the two limbs together with a galvanized bolt countersunk in the bark where new callus will quickly cover it. The holes for the bolt should be the same size as the bolt for a tight fit. The bolt should also be treated with a fungicide before being inserted. After the bolt has been tightened it should be treated with a good tree paint at each protruding end.

After all dead wood has been removed, all cross limbs removed or bolted, and cuts treated with a good tree paint your tree should have a natural look. The inside of the tree should be clear except for the limb structure and a canopy that lets the sun filter through to the lawn below.

When trimming your tree make all cuts flush with the main branch. A stub will cause great trouble in the healing process and usually the wood will decay before the new callus has a chance to cover the wound.

Use a good wound dressing. All cuts an inch or more in diameter should be treated with a good tree paint that has a fungicide added. The wound should be painted at least once a year until healed. One application is usually not enough. If you are unable to find a satisfactory paint you may make your own with zinc oxide and raw linseed oil, adding mineral black for color. This paint will help to retard checking and decay.

EVERGREEN PRUNING. Evergreens should be pruned in the spring before new growth starts, when cuts will heal rapidly. It is also a good idea to remove all dead wood inside the tree for better circulation of air and removal of breeding grounds for fungi and insects. Sometimes the branches on an evergreen are too heavy and should be lightened. To do this, prune back the long branches to a suitable fork inside the heavy foliage. This will check the faster growing shoots and produce a compact growth. The early spring is also a good time to feed evergreens.

FLOWERING ORNAMENTALS. The best time to prune flowering ornamentals is after flowering and then not severely. Just remove dead wood, crossing limbs and water sprouts from inside the canopy. Do not remove all sprouts from the trunk of dogwoods or similar thin-barked trees, for they are subject to sun scald.

APPLE TREES. When pruning young fruit trees, do it lightly until after fruiting and then only once a year, until the tree reaches a good size. After the main trunk has reached eight or nine feet, cut the leader back to an outgrowing lateral branch. This will open up the center of the tree to more light and produce better fruit.

Usually branches growing downward develop poor fruiting wood and should be removed to an upward lateral. It is also good practice to remove limbs growing across the center of the tree. Dwarf trees should be pruned the same, only on a smaller scale.

(Continued on page 124)

*Experienced owner of the Robertson Tree Service, Bellevue, Washington.

†Excepting maples, birches and other trees which "bleed" easily and should be pruned in fall or early winter (Editor).

Leaves from the Arboretum

Factors Which Affect the Flowering of Woody Plants

DR. RICHARD B. WALKER*

RECENTLY the question was asked as to why we have such difficulties in growing and flowering certain plants from higher altitudes—for example, *Rhododendron albiflorum* —when others, including the native conifers *Abies lasiocarpa* and *Tsuga mertensiana* seem to flourish even near sea level. After some reflection and reading, it became clear that I could not give a straightforward answer to this question. However, it may be of some use to review those factors which affect the growth and flowering of woody plants in the hopes that this might offer some ideas which could be applied to the question in point, and perhaps to other problems concerning our woody ornamentals.

By way of introduction, it may be useful to refer to a classification developed by Grainger (1939) with respect to flowering behavior. He recognized several classes, but the ones which are particularly pertinent in our discussion are (a) the *direct flowering plants* in which initiation of flower buds is followed without interruption by subsequent opening of the flowers, and (b) the *indirect flowering plants* in which a distinct period of *rest* intervenes at some stage between initiation of the flower buds and their opening. A large share of woody ornamentals fall into this latter category. In this type, it is much more difficult to ascertain the exact factor or factors most important in regulating flowering, since often a long time intervenes between the initiation of the flower bud and its eventual opening. Thus, it is not surprising that information available about the indirect flowering behavior is considerably less specific than that which is known about direct flowering.

Since I used the term *rest,* this also deserves some explanation. "Dormancy" in plants, which refers in general to inactivity or cessation of activities, can to advantage be replaced by two more specific terms. One of these is *quiescence,* which refers to the cessation of plant growth or other activities which is caused by unfavorable environmental conditions—for example, low temperature. The other term is *rest,* used in a technical sense to indicate cessation of growth or other activities in plants even though environmental conditions may be favorable. *Rest* is frequently observed in seeds and vegetative buds as well as in flower buds. Commonly, it is brought on by shortening of the day length in the late summer and autumn, and frequently a cold treatment is necessary for breaking rest.

Factors Controlling Development and Flowering

1. *Age and "ripeness to flower".* Few woody plants flower during their first year of development, and many must reach a substantial age before flowering can be expected. As a rule, the age required is reasonably constant for a particular species or variety. Unfortunately, little definite information is available as to what makes a plant "ripe to flower". In some instances it appears that size alone is involved, and that a plant will flower when it reaches a certain size regardless of age. In other instances it appears that a certain number of seasonal cycles are necessary before flowering can take place, so that age as such governs rather than mere size. In some plants the amount of stored food material appears to be of considerable importance, and this idea is supported by the fact that girdling or strangling of branches may hasten flowering in plants as diverse as citrus, the pines, and rosaceous fruit trees. The girdling or strangling results in an accumulation of more food materials in the treated branch than normal.
2. *Temperature.* Effects of temperature more often than not dominate in the control of growth and flowering in woody plants.

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These effects can be discussed in two principal headings:

a. *Effects involving quiescence.* By definition, quiescence is the cessation of growth or activity because of an unfavorable environmental condition. In a woody plant such as the western red cedar, *Thuja plicata,* growth continues throughout the year under greenhouse conditions. If growing outside, however, growth slows during the autumn and reaches a negligible rate during the winter months, but resumes full activity again as the temperature rises in the late winter or spring. The twigs of sumac, elderberry, and other plants continue growth until the tips are killed back by frost, then they usually do not grow any more until the next spring. Plants native to higher altitudes whose growth is limited by the lower temperatures of the autumn, winter, and early spring may have a considerably longer growing period if moved to low elevations. This may result in a larger share of the plant's carbohydrates going into vegetative development, thus restricting the amount of food available for floral-bud development.

b. *Thermoperiodism.* This term refers to the effects of temperature as it varies throughout a single daily period or over seasons.

Seasonal Thermoperiodism. Many woody ornamentals have definite seasonal thermoperiodicity. In particular, the breaking of *rest* both in vegetative and flower buds requires a definite extent of cold treatment. For example, in the peach, flower bud initiation does not occur unless the trees have been at temperatures below 50° F. for several months. For the development of flower buds in the *Camellia,* night temperatures must be about 65° F. The buds develop slowly at temperatures this high, however, and require low night temperatures (about 40° to 50° F.) to swell and open. It is easy to understand how the *Camellia* does well in a climate such as our own.

Daily Thermoperiodism. It has been no secret to greenhousemen for many years that best development of many species is encouraged by keeping temperatures lower at night than during the day. With a great many species, about a 10-12° F. difference between the higher day temperatures and the lower night temperatures is favorable to plant growth. Although this pertains particularly to the vegetative development, possible secondary influences on flowering cannot be overlooked.

3. *Photoperiodism.* In the *direct-flowering* plants the time of flower bud initiation is very often controlled by the length of the current daylight periods (actually, the control is by the length of the corresponding night-time periods). Thus, we are accustomed to observing that certain plants bloom in the late spring and early summer under the influence of the long days, whereas many other plants bloom during the late summer and autumn under the influence of the shorter day length at that time. In the *indirect flowering* woody plants, however, the effects of photoperiodism appear to be expressed primarily in the vegetative development. Rate of growth, rest in vegetative buds, dropping of leaves in deciduous plants, and other effects are commonly influenced by the day length. The flowering behavior in woody plants, however, is seldom controlled in large measure by photoperiodism. More commonly, temperature controls flowering, with light cycles being of secondary importance or exercising their effects indirectly through control of vegetative development.

Wave length of light. In the direct-flowering herbaceous plants, the wave length of light received can have a considerable influence upon flowering; particularly the wave lengths just too long for the human eye to see (far-red) appear to encourage the formation of flower buds. In a like manner, with some herbaceous plants it has been shown that ultraviolet light may have a promoting effect upon flowering. Although

no such effects of wave length have been reported so far for woody plants, this may be because of lack of sufficient experimentation.

4. *Chemical control.* The role of chemical control in vegetative development is well known, and the literature reveals many instances in which it appears that flowering also is controlled by chemical substances normally within the plant.

Hormones. The balance of plant hormones, particularly the auxins and the gibberellins, is known to be important in flower bud initiation of the *direct-flowering* herbaceous plants. Investigations involving these substances in woody ornamentals is as yet very fragmentary. Auxin levels are known, however, to vary with season, growth activity, mineral nutrition (with special reference to zinc), and exposure to ultraviolet light. Indirect evidence suggesting the importance of auxin may be gained from the fact that espaliered orientation of branches encourages flowering.

Mineral nutrition. Although information concerning influences of particular mineral elements upon flowering is sparse, some generalizations appear to be warranted. There is reason to believe that any factor such as mineral deficiency which slows down growth may at times promote earlier flowering.

In particular, nitrogen nutrition may have a bearing upon flowering and fruiting. Commonly, excessive nitrogen stimulates vigorous vegetative development, and if light intensity is *low* when nitrogen is *high,* flowering may be inhibited. There is some evidence that the level of iron available needs to be reasonably high for normal flowering, and also other heavy metals may influence flowering by affecting iron uptake.

There are indications that plants which do not clearly respond to photoperiodic stimuli, and this would include many of the woody ornamentals, may be more sensitive to effects of mineral nutrition on their flowering than plants which are responsive to photoperiod.

Conclusions

This rather long discourse on the various influences affecting development and flowering may appear to be far from the subject of the original question. Perhaps it would be worthwhile now to examine some possible suggestions with reference to the original question about *Rhododendron albiflorum* and the conifers. I think we can assume that these plants are unlikely to be strikingly affected by photoperiodism, although this really should be tested by experimentation before making a firm statement. The somewhat higher amounts of ultraviolet radiation at the higher elevations are also unlikely to have a major influence. It seems reasonable to believe that effects of temperature in particular, and perhaps also age and chemical factors, may be predominant.

Plants growing at higher elevations may be of an older age than is sometimes anticipated from their size. Thus, plants growing at lower elevations which have prospered may not be old enough to flower even though they may be large enough. Chemical factors cannot be ruled out, although it would take considerable experimentation to evaluate their possible importance. It is conceivable that hormone balances vary between the locations at higher elevations and in the low-elevation habitats. Differences in exposure, length of growing season because of snow cover, and other factors could affect the carbohydrates which are available for growth and the production of flowers.

Coming back to temperature, I believe that differences in the responses of conifers and members of the heath family to thermoperiodism may offer the best answer to the initial question. The conifers may have a lower total cold requirement for breaking *rest* than *Rhododendron albiflorum.* If so, the mild winters at lower elevations might fully break the *rest* in *Abies* and *Tsuga,* but fail to fully break it in *R. albiflorum.* Also the day to night temperature differences between the two sites could have influence on the vigor of development of a species with narrow tolerance.

Comments from readers pertinent to these problems would be appreciated.

Arboretum Plant Collections*
IV—PINES (genus *Pinus* L. (1753))

PINES planted in the Arboretum will be found in three principal areas, since there is no one suitable section which will contain all we are growing.

(a) the Pinetum, immediately south of E. Lynn St., west of Lake Washington Blvd.

So far as we now know, from written records and old labels, this was planted between 1936 and 1940. The site is well-drained, on a slight rise, and most species have done well, especially *P. aristata, P. Coulteri, P. flexilis, P. Mugo, P. monticola,* and *P. tabulaeformis.*

Unfortunately it is much too small even for pines alone, and the planned R. H. Thomson expressway will cut off the western half during the next two years. Fortunately many of the best trees are in the central portion or on the east side, including the *P. Coulteri* group.

(b) Foster's Island, at the northern end of the Arboretum.

Most planting took place here in 1948-50, with a few species later. These were plants which had been in the nursery during the war years and should have been moved earlier. However, several varieties of *P. nigra,* with *P. Pinaster, P. Banksiana* and *P. contorta* have established and grown satisfactorily. *P. Armandii* is to be found here also, although affected by the early freeze of November 1955.

(c) the steep east bank of Azalea Way, well-drained and receiving considerable afternoon sunshine in summer. Most planting was done here between 1953 and 1956; the majority have grown well, although there have been a few losses in the early stages.

Here can be seen *P. Bungeana, P. cembroides, P. Lambertiana, P. Peuce* and several of the hybrids from Placerville, as well as the rare and remarkable *P. kwangtungensis,* which fortunately survived the 1955 freeze. In a few years they should form an appropriate background for the Japanese cherries below them.

(d) A smaller number, chiefly the hybrids, is growing on the bank east and north of the Madison St. entrance; although on heavier soil and receiving less sunshine than the other sites this seems to suit most of those planted here. Some older trees of *P. nigra* and a single *P. Thunbergii* have been here much longer, no doubt planted by the Parks Department prior to the establishment of the Arboretum in 1935.

The total numbers listed below are: species, 40; varieties, 11; garden forms (clones), 6; hybrids, 10, making 67 kinds in all. In addition there are 19 others now growing in the lath houses or frames for future planting and trial.

P. aristata Engelm. (1862)
Rocky Mtns., from Colo. southwards
Bristlecone pine.
(a) Three oldest trees in Pinetum, planted 1940 or earlier, but no records; height now 11, 12, and 17 ft. (b) Three younger from Hopkins Nsy., Bothell, Wash., 11/56 (then 4 ft.), pl. 3/57 on bank south of cottage; now 4.5-5.5 ft. Slow in growth but attractive in form and excellent for small gardens (fig. 16).

P. Armandii Franchet (1885)
C. &. W. China, Taiwan and Korea
Arb. des Barres, France, (sd., 1939); four planted Foster's Island, 11/47. One killed by cold and one severely damaged, 11/55; remaining two now 18 and 25.5 ft. Other younger plants in nsy. from same source. An elegant species, certainly worthy of wider planting in this region.

P. attenuata Lemmon (1892)
S.W. Oregon to N.W. Mexico
Knobcone pine.
(a) Three oldest trees in Pinetum, of unknown origin, but probably planted about 1937; tallest now 43 ft. (b) One plant from H. Nelson, San Francisco, 12/49; pl. Foster's Island, 11/50; now 12.5 ft. Tree of compact, upright habit; cones very persistent along branches. Foliage burned by cold in 11/55.

P. Ayacahuite Ehrenb. (1838) Mexico
Hillier & Sons Nsy., Winchester, England, (sd., 1948). Six planted in three locations, between 3/53 and 12/54. Two survive on ridge S. of Woodland Gdn., now 5 and 7 ft. tall; others on E. bank of Azalea Way and above rock gdn. killed by cold, 11/55. An attractive pine; should be planted again in another situation.

P. Banksiana Lamb. (1803)
Canada, N.E. U.S., W. to Minn. and Wis.
Jack pine.
(a) C. Wilson Nsy., Pembine, Wis. (pl., 1945). Five pl. Foster's Island, 11/47; now 24 to 32 ft. Four others pl. N.W. part of Arb., 2/50; removed to Univ. of Wash. campus, 1962, prior to construction of 2nd Lake bridge. (b) N.Y.

*The fourth in this series: Maples, Magnolias and Birches have been previously recorded.

Bot. Gdn., (sd., 1945); two pl. Foster's Island 11/47; now 25 and 34 ft. tall.

P. Bungeana Zucc. ex Endlich. (1847) N.W. China
Lacebark pine.
(a) Morris Arb., Philadelphia, (sd., 3/48). Three pl. 4/56, E. bank of Az. Way; now 6,6, and 4.5 ft. One pl. S. of cottage, 12/57; now 4.5 ft. (b) Inst. Forest Genetics, Placerville, Calif. (sd., coll. Peiping, China, 4/48). One planted on N. bank of Jap. gdn., 11/61; now 2 ft. tall. Of slow growth and bushy habit in its early years, but of much interest and beauty later.

P. Cembra L. (1753) C. Europe to N.E. Asia
Swiss stone pine.
Two plants purchased from Tindall Nsy., Bothell, Wash., 4/61, 3-3.5 ft. tall. Pl. on rock gdn., same month. Now 3.5-4.5 ft.

P. cembroides Zucc. (1832)
S.W. N.M., S.E. Ariz., to N. Mexico
Nut or pinyon pine.
(a) D. H. Smith, Tacoma, Wash. (2 pl., 1/44). Pl. Foster's Island, 11/47. One moved to E. bank of Az. Way, 4/55; now 8 ft. (b) Herbst Bros., New York, (sd., 2/50). Two pl. 5/56, S. side of offices, now 4.5 and 5 ft.
var. **edulis** (Engelm.) Voss (1904) *(P. edulis* Engelm.) Origin unknown. Four pl. moved from S. end of Arb. by Madison playfield parking lot to Foster's Island, 1950. Two of these transplanted to E. bank of Az. Way 4/55; now 5.5 ft. tall. One remains on F. Island.

P. contorta Douglas ex Loudon (1838)
Alaska to Calif.
Shore pine.
One tree of unknown origin in Pinetum, now 36 ft.
var. **Bolanderi** *(Parl.)* Vasey (1875). L. L. Edmunds Nsy., Danville, Calif. (2 pl., 4/58). Pl. in Pinetum, 11/62; now 6-7 ft.
var. **latifolia** Engelm. (1871)
Alaska; Rocky Mts., to Calif.
Lodgepole pine.
(a) Univ. of Wash., Seattle, (8 pl., 1937). Pl. in Pinetum. Four remaining trees now 22 to 32 ft. (b) N.Y. Bot. Gdn., (sd., 1/46). Two planted Foster's Island, 10/50; largest now 29 ft.

P. Coulteri D. Don (1836)
C. and S. Calif., N. Lower Calif., Mexico
(a) Group of eight trees in Pinetum at E. Lynn St., of unknown origin, probably pl. 1936-38. Dimensions of three trees measured 11/63; ht. 39, 45, 47.5 ft.; d.b.h. 17.5, 18.5, and 14.5 ins. respectively. (b) Lester Rowntree, Carmel,, Calif., (sd., 1948). Three pl. N. end of Foster's Island, 10/50. In 1960 aver. ht. 13-15 ft. Removed by bridge construction, 1962. One pl. 3/53 E. bank of Az. Way; now 19 ft. tall. A very satisfactory pine for Seattle, on a suitable site and where adequate space is available for development (fig. 17).

P. densiflora Sieb. & Zucc. (1842) Japan
Japanese red pine.
(a) One tree of unknown origin on W. side of Arb. Dr. E., S. of offices; 29 ft. (b) Kyoto Bot. Gdn., Japan, (sd., 5/41); two pl. Foster's Island, 11/47. One remains, now 20 ft. tall. One immediately E. of Madison St. entrance, 10/49; now 20 ft. (c) Corydon Wagner, Tacoma, Wash. (sd., from Japan, 1/55). Two pl. 11/60, N. end of Jap. gdn., W. tree now 7.5 ft., E. tree 4.5 ft., (leaders removed).
'Oculis-Draconis' One plant from R. Marshall, Wethersfield, Conn., 3/57. Pl. Jap. gdn., 3/61; now 7.5 ft.

P. echinata Miller (1768) E. U.S.
Shortleaf pine.
Inst. Forest Genetics, Placerville, Calif., (sd., 5/48). Three pl. Foster's Island, 11/51; two remaining now 10 and 10.5 ft. Two pl. 3/54. E. side of Arb. nsy., one remains, now 10.5 ft. Another, of same stock, by Units greenhouse, 13.5 ft. Rather slow in growth here; could well be used in small gardens.

P. Engelmannii Carr. (1854) *(P. latifolia* Sarg.; *P. apacheca* Lemm.) Apache pine, U.S. Forest Service, Carson, Wash. (Wind River Arb.). Eight pl., 1/37; two remain in Pinetum, now 11 ft. tall. Not a success here, but remarkable for the length of the leaves.

P. flexilis James (1823) S. Alberta to N. Mexico
Limber pine.
(a) U.S. Forest Service, Wind River Arb., Carson, Wash. (pl., 1937). Five trees remain, in Pinetum; tallest 31 ft. (b) Carl S. English, Jr., Seattle; (sd., 1/48). Two planted 4/56, two 12/56, E. bank of Az. Way; now 4-6 ft. tall.
Var. **reflexa** Engelm. (1878) (*P. strobiformis* Engelm.) S.W. N. M., S.E. Ariz., N. Mexico
Plants from Wind River Arb., 1937. Seven remain, Pinetum, 26-32 ft. Two of these are slow-growing, compact pyramidal forms, now 10.5 and 12.5 ft. tall. A few have been propagated for further trial.

P. Greggii Engelm. ex Parl. (1868)
Mexico (N.E. and E.)
National Pinetum, Bedgebury, Kent, England; (sd., 10/60). One planted, old nursery area, 11/63.

P. Griffithii McClelland (1854) (*P. nepalensis* De Chambray; *P. excelsa* Wall. ex Don; *P. Wallichiana* A. B. Jackson)
W. Afghanistan and Himalaya Mts.

Pinus aristata, 14′ tree in Pinetum.
FIG. 16 JAN. 4, 1963

Himalayan white pine.
(a) Mr. and Mrs. O. B. Potter, Olympia, Wash. (two pl., 10/49). One pl., 3/54, on bank south of Asiatic maple coll. Now 15 ft. tall. (b) Mrs. McElhenny, Seattle; scions, 2/51, grafted on **P. Peuce.** One pl. 12/56, E. bank of Az. Way; now 8.5 ft., leader broken. Another, pl. 3/57, on bank S. of stone cottage; coned 1961; now 17 ft. tall. (c) Mrs. A. C. U. Berry, Portland, Oregon; (sd., 4/55; S.S.&W. 9018, from Nepal). One pl. 2/61, on bank E. of Madison St. entrance; now 11 ft. Three pl. 2/61, on hill N. of **Lonicera** coll., W. of Az. Way. Damaged later by vandals; now 3-4 ft. Two pl. top of hill S. of greenhouses, 11/61; now aver. 6 ft. A promising species for the Puget Sound area. The hybrids will be worth watching.

P. Heedreichii Christ var. **leucodermis** (Ant.) Markgraf ex Fitschen (1930)
S. Italy, Balkan Penin.
Bosnian pine.
Arb. des Barres, France; (sd., 6/49). One pl. 12/56, E. bank of Az. Way; now 3.5 ft. Of very slow growth here. Occurs naturally on limestone soils.

P. Jeffreyi Grev. and Balf. (1853)
S.W. Oregon to N. Lower Calif., E. to W. Nevada
Jeffrey pine.
(a) Plants of unknown origin on Foster's Island; two largest now 15 and 16.5 ft.; probably pl. 1940 or earlier. (b) Strander Nsy., Seattle; two plants, 11/56. Pl. 3/60, by E. nsy. fence; now 6 and 7 ft. tall. (c) Prof. C. F. Brockman, Univ. of Wash., Seattle (sd., 3/54, coll. Lassen Co., Calif.). Three pl. 12/62, by nsy. rd; now 2.5-3.5 ft. tall. Slow in growth and stiff in habit, but can be used in well-drained, sunny situations around Seattle.

Pinus Coulteri group in Pinetum, about 40′ tall.
FIG. 17 DEC. 31, 1962

P. koraiensis Sieb. & Zucc. (1844)
Korea and Japan
Korean pine.
Dominion Arb., Ottawa; (sd., 1941). Two pl. Foster's Island, 4/48. One moved to S. end of parking lot nr. Madison Playfield; now 14 ft. tall and cones sparsely. Should be given further trial here.

P. kwangtungensis Chun ex Tsiang (1948)
S. China
One plant received 8/40; origin unknown. Plt. 4/48, Foster's Island. Moved to E. bank of Az. Way, 4/55; now 6 ft. tall. Coned 1961. Propagated by grafting on **P. Strobus** or other 5-needled species. One plant to rock garden, E. side, 11/57, now 6 ft. Another to W. side, 4/49, same size; both have coned.
See note in *Arb. Bull.*, XXII, (4), 123, 138, (Winter 1959). An attractive as well as unusual species, apparently of bushy habit.

P. Lambertiana Douglas (1827)
S. Oregon to Lower Calif., Mexico
Sugar pine.
(a) Mrs. T. C. Frye, Seattle; (sd., 12/46). Four planted Foster's Island, 10/50. Two died from drought, summer 1951; replaced 11/51. Two removed to E. bank of Az. Way, 3/53 and 12/54. Two more planted, 4/56; ht. now 8-11.5 ft. One pl. on ridge S. of Woodland Gdn., 11/55; now 11 ft.
(b) Dr. W. R. Naumann, Seattle; (sd., coll. California, 3/48). Three pl. same ridge as last, 3/54; two lost, remaining pl. now 12 ft., leader damaged.
Growing very satisfactorily, but will need space to develop.

P. Montezumae Lamb. (1839) Mexico
Two plants received from Longwood Gdns., Kennett Square, Pa., 10/60. Both pl. in old nsy. area, 11/63. Previously in cold frame during winter.

P. monticola Douglas (1832) So. B.C. to W. Montana, C. Calif. and W. Nevada
Western white pine.
(a) Twenty pl. received from — Scott, Seattle, 12/37. Two in Pinetum now 28 ft. Several others in same area, of unknown origin, now 37-40 ft.
(b) from B. O. Mulligan, Arboretum, several pl. coll. in Chiwawa river valley, Chelan Co., Wash., 7/50. Two pl., 1/55, on upper E. bank of Az. Way; now 7.5-8.5 ft. tall.

P. Mugo Turra (1764)
Mtns. of C. and S.E. Europe
Mountain pine.
(a) Group of six older plants in Pinetum, of unknown origin, now 9-18 ft. tall. Two more on E. bank of Blvd. N. of E. Lynn St. bridge, of comparable age and size. (b) Mrs. Lee, Seattle; (two pl., 10/47). Pl. Foster's Island, 4/48. One died, other now 18 ft. (c) J. Dunbar, Seattle; (four pl., 9/56). All pl., 11/57 and 1/58, on bank S. of cottage. Two now 2 x 3 ft. These may be var. **pumilio** (Haenke) Zenari. (d) Mrs. J. J. Morrison, Seattle; (two pl., 11/60). Pl. N. end Jap. gdn., 11/60. One died, other now 3.5 ft.

Var. **rostrata** (Ant.) Hoopes (1868)
Pyrenees to W. Alps
Bureau of Parks, Rochester, N. Y., (sd., 1/50). Two pl. 5/56, on rock gdn.; now 3 and 5.5 ft. Three pl. on bank S. of cottage; one now 5.5 ft.

P. muricata D. Don (1836)
N. coastal Calif. to Lower Calif.
Bishop pine.
(a) Several trees, up to 30 ft. tall, killed by cold in Pinetum, Nov. 1955; origin unknown, but probably pl. 1936-38. (b) From Carl S. English Jr., Seattle; (sd.; 2/56). One pl. 11/62, along bank S. of cottage; ht. 5 ft. Stolen 11/63. One remains in nsy.

P. nigra Arnold (1785)
var. **austriaca** (Hoess) Badoux (1910)
C. to S.E. Europe
Austrian pine.
From N. Y. Bot. Gdn.; (sd., 3/45). Five pl. 4/48 and 11/49, on Foster's Island. Now 13.5-25 ft.

var. **caramanica** (Loud.) Rehder (1927)
Asia Minor
Crimean pine.
N. Y. Bot. Gdn.; (sd., 3/45). Three pl. 11/48, Foster's Island; now 15.5 ft.

var. **cebennensis** (Godr.) Rehd. (1922)
Pyrenees and S. France
Bot. Gdn., Copenhagen; (sd., 1940). Three pl. Foster's Island, 4/48; now 22-24 ft.

'Hornibrookiana'
One pl. from Bureau of Parks, Rochester, N. Y., 12/55. Pl. S.E. of cottage, 3/57; now 2 x 4 ft.

P. parviflora Sieb. & Zucc. (1842) (*P. pentaphylla* Mayr)
Japan
Japanese white pine.
Hiller & Son Nsy., Winchester, England; sd. 1/48, as f. **glauca.** One pl. S. of cottage on bank, 3/57; now 5 ft. Two pl. E. side of rock gdn., 11/59, now 3-3.5 ft. tall. Plants from another source are now available in the nsy.; it is hoped to place them in a different location, since this can be a very ornamental pine when growing well.

P. patula Schl. & Cham. (1831)
Eastern Central Mexico
(a) W. B. Clarke Nsy., San Jose, Calif.; (two pl., 3/56). Pl. 4/56, at top of bank above Az. Way; now 15 and 20 ft. tall.
(b) Prof. M. Martinez, Mexico City; (sd., 7/57). Two pl. E. side of nsy. area, 1960-61; now 8-12 ft. An earlier planting (1952-53) of three trees was killed by cold in Nov. 1955.

P. Peuce Griseb. (1844)
Balkan Mts.
Macedonian pine.
(a) F. W. Schumacher, Jamaica Plain, Mass.; (sd., 3/47). Three pl. 12/54, on E. bank of Az. Way; now 8-16 ft. tall. (b) Carl S. English Jr., Seattle; 10 pl., 5/48. Two pl. 12/56 same location; now 8-9 ft. Compact and pyramidal in form, these promise to make attractive trees.

P. Pinaster Aiton (1789)
Mediterranean region
Cluster or maritime pine.
(a) One tree in Pinetum, of unknown origin, probably 25-26 years old, 46 ft. high, d.b.h. 13 ins., coning. (b) Herbst Bros., New York; (sd., 2/47). Five pl. Foster's Island 12/48; two replaced 11/51; three now remain, 23.5, 21.5, and 19 ft. tall. One pl. E. bank of Az. Way, 3/53; now 20 ft. Evidently one of the fastest growing pines for this area, tolerating the cold weather in Nov. 1955 remarkably well.

P. Pinea L. (1753)
Mediterranean region
Stone pine.
(a) One older tree in nsy. area, of unknown origin, now 20 ft.
(b) Three young trees, raised from seeds in 1950, pl. 1954, failed to survive cold in 1955.

P. pithyusa Stev. var. **Stankewiczii** Suk. (1905)
S. U.S.S.R.
Bot. Gdn., Jalta, Crimea, U.S.S.R.; (sd. (coll.), 2/58). Four pl. N. end of Foster's Island, 11/63, 3 ft. tall.

P. ponderosa Lawson (1836)
From N.D. and southern B.C., S. to N. Mexico, E. to Texas and Okla.
Western yellow pine.
Several trees in Pinetum and on Foster's Island probably originated from plants received from the U.S. Forest Service Arb., Wind River, Carson, Wash., 1/37. Tallest, of six, in Pinetum, 45 ft.; d.b.h. 11 ins.; on Foster's Island, 48 ft., d.b.h. 12 ins.

P. pseudostrobus Lindley (1839)
Mexico
Prof. M. Martinez, Mexico City; (sd., 7/57). One pl. 11/63 in old nsy.

P. pungens Lamb. (1805)
E. U.S., in mtns.
Table mtn. pine.
(a) Inst. Forest Genetics, Placerville, Calif.; (sd., 11/49). Two pl. E. bank Az. Way, 4/56; now 7 and 13 ft., coning (S. tree). (b) Arb. des Barres, France; (sd., 4/52). One pl. 12/56, same site; now 3 ft. Another, 3/60, on bank S. of cottage; now 5.5 ft.

P. pumila Regel (1858)
N.E. Asia, incl. Japan
U.S. Forest Service, Upper Darby, Pa.; (sd., from Japan, 4/50). Two pl. on rock gdn., 11/57; one remains, now 4 ft. wide, 14 ins. tall. An interesting natural dwarf species.

R. resinosa Aiton (1789)
E. Canada and U.S., W. to Manitoba and Wis.
Red pine.
Wind River Arb., Carson, Wash.; (pl., 1937), in Pinetum. Average ht. of trees now 21 ft.

P. rigida Miller (1768)
S.E. Ontario to Ohio, Va., and in mtns. to S.C.
Pitch pine.
U.S.D.A. Bureau of Pl. Intro.; (sd., 3/45). Five pl. Foster's Island, 11/47; one remains, now 19 ft. tall.

P. Sabiniana Douglas ex. D. Don (1832)
S.W. Oregon to S. Calif.
Digger pine.
(a) One tree of unknown origin, N. end of Foster's Island, a poor site, 37 ft.
(b) Carl S. English Jr., Seattle; (sd., 4/48). Three pl. Foster's Island, 10/50. One survived until 1962, then removed by bridge construction; 11 ft. tall in 1960.
(c) Rancho Santa Ana Bot. Gdn., Claremont, Calif.; (sd., 3/57). One pl. Pinetum, 11/62; now 3.5 ft. (d) Mrs. A. Svihla, Kirkland, Wash.; two pl. 8/56. One pl. Pinetum, 12/62; now 3.5 ft. Quite a fast growing, attractive pine. normally perfectly hardy here, but should be given a situation facing S. or W., preferably on a hillside.

P. Strobus L. (1753)
E. Canada, W. to Manitoba; in U.S., W. to Minn. and Iowa; S. to N.C., Ga. and Tenn. in mtns.
Eastern white pine.
Two older trees beside Blvd. S. of Jap. gdn., 52-53 ft. tall.
Other younger trees of unknown origin in Pinetum and along Blvd. between Boyer Ave. and E. Lvnn St.
'Brevifolia' (*'Pygmaea'*; *'Nana'*): three pl. from Saxton & Wilson, Maplewood, Oregon, 12/56. Two pl. rock gdn., 11/57; now 2 and 3.5 ft.
'Fastigiata'; one pl. from Brimfield Gdns., Wethersfield, Conn., 3/57. Pl. S.W. corner Jap. gdn., 11/61; now 6.5 ft.

P. sylvestris L. (1753) Europe to Siberia
Scots pine.
(a) Wash. State Dept. of Agriculture nsy., Pullman, Wash.; (pl., 4/37); group in Pinetum, now aver. 40-50 ft. Another group of unknown origin, apparently somewhat younger, on bank S. of cottage. (b) N. Y. Bot. Gdn.; (sd. 1/46). Three pl. Foster's Island, 11/48; two now 18 and 27.5 ft. (c) Bot. Gdn., Univ. of Latvia, Riga, U.S.S.R.; (sd. 4/57). Four pl. Foster's Island, 11/63, 3.5 ft. Grows fast and makes an attractive group, especially for the orange color of the bark.

'Fastigiata'; one pl. from Brimfield Gdns., Wethersfield, Conn., 3/57. Pl. by nsy. road, 11/61; now 3.5 ft.

'Pumila' (?). Received as **'Watereri'**; one pl. from Tindall Nsy., Bothell, Wash. Pl. 5/61, N. end of Jap. gdn.; now 4 ft.

P. tabulaeformis Hort. ex Carr. (1867)
N. and W. China
Chinese pine.
(a) Five pl. of unknown origin, in Pinetum, received 12/37. One now 23 ft. (b) U.S.D.A., Bureau of Pl. Intro., (two pl., 2/40, as *P. muricata*, P.I. 122692). One pl. Foster's Island, 4/48; now 24 ft., coning. Site much damper than in Pinetum. (c) N. Y. Bot. Gdn.; (sd., 1/46, as *P. sinensis*). Two pl. Foster's Island, 11/49. One remains, now 20 ft. This pine, with its spreading form, hardiness, and coning rather early, has considerable merit, especially for smaller gardens.

var. **Wilsonii** (Shaw) Wu W. China
Four plants received 12/37, of unknown origin; pl. in Pinetum. Now 22-24 ft. tall. Identified at Arnold Arboretum, 2/63, by Dr. Hu. The var. has more slender leaves and is less stiff in habit than the type plant.

P. Thunbergii Parl. (1868) Japan
Japanese black pine.
(a) One older plant remains of group E. of Madison St. entrance, of unknown origin; ht. 38 ft., d.b.h. 11 ins. Others killed by cold, 11/55. Another group in Pinetum, probably younger. Two of these moved to S. gate of Jap. gdn., 1960. Tree outside gate now 24 ft. (b) Everett Junior College, Wash.; (2 pl., 11/58). Pl. N. end of Jap. gdn., 11/60; one remains, 4.5 ft.

P. virginiana Miller (1768) E. U.S.
Virginia pine.
N. Y. Bot. Gdn.; (sd., 3/45). Four pl. Foster's Island, 11/47; two remained 5/56; by 12/60, 16-17 ft. tall. Both died summer 1963 from fungal attack. Quite distinctive in habit, with a broad bushy head and usually several stems; their loss is regretted.

HYBRID PINES (ESTABLISHED IN ARBORETUM)

P. Armandii X **P. koraiensis**
Inst. Forest Genetics, Placerville, Calif.; (sd., 6/54). Two pl. on hill W. of Az. Way, N. of **Lonicera** coll., 12/61. Damaged by vandals; now 3.5-4.5 ft. Two pl., N.W. corner Jap. gdn., 4/62: now 4.5-5.5 ft.

P. flexilis X **P. Griffithii**
Scions from Placerville, 2/54. Three pl., 10/56, on bank S. of cottage; one died 1962; others now 12.5 and 14 ft.

P. monticola X **P. Ayacahuite**
Scions from Placerville, 2/54. One pl. 12/56, on E. bank of Az. Way; now 10 ft. tall. One pl. on upper bank, same area, 12/58; now 6 ft.

P. monticola X **P. Griffithii**
Scions from Placerville, 2/58. One pl. 11/62, by nsy. road; now 4.5 ft.

P. monticola X **P. Strobus**
Seeds from Placerville, 2/50. Three pl. E. bank Az. Way, 4/56; now 13-15 ft. tall. One pl. 12/56, same area, now 9.5 ft.; another 2/58, now 5 ft.

P. X Murraybanksiana Righter & Stockwell (1949); (*P. contorta* var. *latifolia* X *P. Banksiana*).
Sd. from Placerville, 2/50. Four pl. on bank S. of cottage, 4/56; now 10-14.5 ft. Coned 1962.

P. ponderosa X **P. Engelmannii**
Seeds from Placerville, 2/50, (two different stocks). (a) One pl. near Madison St. entrance, 10/56; now 16 ft. tall. Another, by E. fence of nsy., 3/59; now 10 ft. (b) One pl. 2/58, Foster's Island; now 9 ft. The first mentioned is a particularly handsome young tree, of good form and with long leaves.

P. ponderosa X **P. ponderosa** var. **arizonica**
Seeds from Placerville, 2/50. One pl. E. bank of Az. Way, 4/56; now 14.5 ft. Another on E. side of nsy., 3/59; now 7.5 ft. Another, same site, 4/60; now 4.5 ft.

P. ponderosa X **P. ponderosa** var. **scopulorum**
Seeds from Placerville, 2/50. Two pl., 4/56, E. bank of Az. Way; now 11 and 18 ft., former with broken leader.

P. Strobus X **P. Griffithii**
Scions from Placerville, 2/54. One pl. on bank S. of cottage, 3/57; now 14 ft. Coned 1961. Another pl. E. side of Foster's Island, 2/58; now 6 ft., leader broken twice. Coned 1959. Another on E. side of nsy., 3/59; now 11 ft., coning.

OTHER PINES IN NURSERY, LATHHOUSE AND FRAMES

P. Ayacahuite var. **brachyptera** Shaw (1960)
Mexico
Scions from Arnold Arboretum, Boston, Mass., 1/62.

P. Cembra var. **sibirica** Loudon (1830)
N.E. U.S.S.R.
Botanical Gardn., Academy of Sciences, Moscow; sd. 7/55.

P. Gerardiana Wall. ex Lamb. (1837)
Afghanistan and N.W. Himalaya
Botanical Garden, Hobart, Tasmania; sd., 10/58.

P. flexilis 'Glenmore Dwarf'
Plant from R. E. More, Denver, Colo.; 9/55.

P. Elliottii Engelm. (1880) S.E. Coastal U.S.
Slash pine.
Villa Taranto, Pallanza, Italy; sd., 4/61.

P. Heldreichii Christ (1863) Balkan Penin.
Bot. Gdn., Gothenburg, Sweden; sd. 4/51.

P. leiophylla Schl. & Cham. (1831) Mexico
Prof. M. Martinez, Mexico City; sd. 1/63.

var. **chihuahuana** (Engelm.) Shaw (1909)
So. N.M. and Ariz., N. Mexico
Carl S. English Jr., Seattle; sd., (coll.) 12/62.

P. nigra Arnold (1785)
C. & S. Europe to Asia Minor
Botanical Garden, Istanbul, Turkey; sd. 5/57.

var. **banatica** Georgescu & Ionescu Rumania
Inst. Forest Res., Bucharest, Rumania; sd. (coll.) 4/58.

var. **caramanica** (Loudon) Rehd. (1927)
Pallasiana (Lamb.) Aschers. & Graeb. (1897)
Asia Minor
Botanical Garden, Istanbul, Turkey; sd., 4/58.

(Continued on page 127)

Northwest Members of the Ericaceae*

PAT BALLARD

Kalmia polifolia Wang. (1787) — swamp laurel, bog laurel, bog kalmia. Grows in lowland marshes, bogs or mountain meadows. There are two forms in our area; var. *polifolia*, usually more than 8 inches tall, growing from eastern North America across northern Canada and down the Pacific Coast on the west side of the Cascades; var. *microphylla* is an alpine form, seldom more than 4 inches tall, found from Alaska to California, east to the Rocky Mountains and south to Colorado. Dr. Hitchcock* mentions *K. occidentalis* Small which was described from an intergradient plant between these two variants. Cuttings, taken in August, strike quite readily. Seed may be planted either as soon as it has ripened or in February. We treat it as we would rhododendron seed. Layerings may be made in June. Though these bog plants grow where their roots are moist, if not actually in water, they do very well under garden conditions. A miniature form of var. *microphylla* was found growing in the moss along a lakeshore in the Chinook Pass area in Washington. None of the shrublets were more than 3 inches tall and the leaves were the smallest I have ever seen. We have not yet seen this form in bloom so we cannot report on the size or color of its corolla. Zone II.

Ledum glandulosum Nutt. (1843)—trapper's tea, glandular Labrador tea. An evergreen shrub, certain forms of which show strong resemblance to some of the small-leaved rhododendrons. All ledums have pungently fragrant leaves and clusters of small white flowers similar to *Rhododendron micranthum*, though corollas of *Ledum* are polypetalous (petals separate) and the corollas of *Rhododendron* are gamopetalous (petals joined—at least at the base). L. D. Hills* suggests that seed be sown either in March or in late summer and that some of the peaty soil should be taken from around the parent plant, in order that the seedlings may start off with their "friendly fungi". He feels that cuttings will not gain us much in time but that soft-growing tips or half-ripened wood may be removed without a heel, treated with a rooting compound and inserted in peat. Mansfield* says cuttings should be taken in August. We have grown them from late summer cuttings and from seed in February. Royton Heath* suggests that ledums be given leafmould and peat, grown in half-shade, protected from drying winds and mulched with half-decayed leaves in the late spring and autumn. *L. g.* var *columbianum* has glabrous leaves that are usually revolute, similar to those of *L. groenlandicum* in form but without the hairy undersurface of those of the true Labrador tea. In our garden the glabrous-leaved ledums flower more profusely than *L. groenlandicum*. Var. *columbianum* is found along the coast from northwest Washington to Marin County, in California. Zone V or VI.

L. groenlandicum Oeder (1766) — Labrador tea. The leaves of this plant were used by the colonists for tea, during the Tea Embargo at the time of the Boston Tea Party and are still used by the inhabitants of the Arctic. *L. glandulosum* should *not* be used as a beverage. It is said to be toxic, as are certain other members of this family. Though this species is found growing in marshes and bogs, it will adjust to garden conditions. Our experience has been that it is more susceptible to garden pests than *L. glandulosum*. It may be propagated in the same way as the above species of *Ledum*. Zone II.

Loiseleuria procumbens (L.) Desv. (1813)—alpine azalea or creeping alpine azalea. An evergreen shrublet of the alpine and arctic tundra, gravelly slopes in higher mountains, and sandy barrens and peaty soils on the northern coasts. Circumpolar distribution. In North America it is found in Alaska, along the coast to southern Vancouver Island, Hudson Bay south to Mount Katahdin in Maine, where it is said to be part of the relict flora. One of our study group members collected it in a muskeg near Ketchikan, Alaska. It has been said that the European form flowers better than the Alaska form. This low-growing, much-branched shrublet has rather deep pink flowers that are paler inside. White-flowered forms have been found, but rarely. One of the charms of this little shrub is the dark red color of the new growth. It likes a peaty soil in a sunny, but not dry, situation. We have it growing on the northeast side of a Douglas fir in a raised bed, where it is tucked against an old log. It flowers well in this situation, where it is protected from the noonday and afternoon sun but is not in heavy shade. *Loiseleuria* may be propagated by cuttings of non-flowering shoots, in June or July. It doesn't like pot-culture but does well in an old cedar flat, in a sandy, peaty soil to which has been added some well-rotted wood.

Menziesia ferruginea Smith (1791)—fool's huckleberry or false azalea. This species is often collected in the mistaken belief that it is a native azalea because of its attractive leaves and its branching pattern (similar to that of *Enkianthus*). Its flowers are yellowish and much smaller than those of the Japanese menziesias. Dr. Hitchcock* says it is rather desirable as an ornamental and he describes two varieties: *ferruginea*, found from Alaska along the coast and in the Cascades to northern California, and *glabella*, from eastern Washington and Oregon to the Rockies, down the Columbia to Mount Hood and Mount Adams. We have found it in the Humid Transition and Canadian Zones. Wilfred Sheat*, speaking of menziesias generally, says they are difficult to propagate and suggests that a stock plant may be planted in a moist, shaded bed of peat moss and sand before being divided in the early spring. We have found many self-sown seedlings of *M. ferruginea* in our woodland garden, some of them far from the parent plant. Several of the Japa-

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*Continued from Fall, 1963, *Bulletin*.

**See bibliography at end of this article.

nese and American species have come well from seed and have given us no difficulties. Our own seed is sometimes planted as soon as it is ripe; other times we have kept it in a covered jar (in the refrigerator) until February, as we do commercial seed. We sow it in small, clear plastic boxes, half filled with two parts sieved peat and one part fine sand. The seedlings are transplanted to half flats and kept in the cold frame for a year or two. It has been said that menziesias need a supply of moisture during the growing and flowering season. We have found that they respond to the same treatment that we give rhododendrons. Royton Heath* suggests a top dressing of loam, peat, and sand in the fall and spring. Layerings may be started in early May but should not be lifted for at least one year. Zone V.

Phyllodoce empetriformis (Sm.) D. Don (1834)—pink mountain heather. Has been called *Menziesia empetriformis* Sm., *Bryanthus empetriformis* A. Gray. An evergreen heather-like shrub, from 4 to 16 inches tall, with rosy-pink bells. Found from Alaska to California, east to Idaho and Montana, usually in mountain meadows, in alpine and subalpine zones.

Cultivated plants seldom look really happy; perhaps they need to be crushed under heavy, mountain snows. It exists in our gardens, even flowers, but does not grow lushly as it does at higher elevations. It has been suggested that phyllodoces need an acid, sandy soil. A peaty soil, in an open situation, is preferred and they should never be allowed to dry out. If they become leggy a severe pruning is beneficial.

Phyllodoces may be propagated from soft tip cuttings, in July-August, or from half-ripened, older wood taken with a heel. Seeds may be sown in sandy, peaty soil and placed in the open, with a north exposure, according to one writer. We have grown them from seeds, in plastic boxes, then placed them in a coldframe, after the first transplanting, for a year. Heath* says this is one of the best of the phyllodoces and the easiest to cultivate. He says it should be protected from the early morning sun and suggests adding sandstone to the peaty soil surrounding the plant. He also advises giving phyllodoces a two-inch mulch of half-rotted leafmold in the spring. Zone V.

P. glanduliflora (Hook.) Coville (1897)—yellow mountain heather. In the garden, this seems to be less compact than *P. empetriformis*. Its leaves are shorter and the flowers are pale yellow and urn-shaped, not bell-shaped like the pink corollas of *P. empetriformis*. Found on mountain slopes, rocky ledges and in open areas near and above the timber line. It ranges from Alaska and British Columbia to western Alberta, south to Oregon and Wyoming. Dr. Hitchcock* mentions several natural hybrids between the two species (*P. X intermedia* (Hook.) Rydb.)

Pyrola L.—shinleaf. Dr. Szczawinski* calls this "wintergreen" and gives the genus *Gaultheria* the common name of "false wintergreen". Since pyrolas are very difficult to transplant or to propagate, most authorities suggest that they should be left in their native habitat. We have collected them, occasionally, in flats that we immediately covered with plastic sheeting and left on as a protection for several weeks after they were placed in a cold frame. We removed the plastic roofing during the summer months, but left the lath covers in place. These plants have far out-stripped those planted out, though we planted them in our Douglas fir grove, where the conditions are similar to those they had known. Those growing in our woodland are alive but do not flower well and the slightest mishap, weather-wise or man-made, will send them into a decline. Taylor and Hamblin* say the seed germinates poorly and suggest that they might be propagated by division of underground runners, in peat and sand, and placed in a shaded frame. L. D. Hills* says all species will flourish in a soil of seven parts of leafmold to two parts of loam and sand. He adds a no. 60 (3-inch) potful of bonemeal to the barrow load. He says they may be divided in September or in April when growth is beginning. They may be placed in a shaded frame, plunged in peat, and should be ready to plant out the following April. Sow seed in March on sterilized sphagnum moss, on coaldust over peaty seed soil, or in a plastic box on a mixture of two parts sieved peat moss to one part fine sand. When sown in a flat they should always be watered from the bottom. If sown in a plastic box that is tightly covered they seldom need water before transplanting.

P. uniflora L. (1753)—sometimes called *Moneses uniflora*, is probably the gem of the genus. It is a tiny, matting, moisture-loving treasure. The one-inch white flowers are held above the foliage. Several gardeners of our acquaintance have grown it fairly successfully for two or three years and then have watched it disappear bit by bit. We have found no one in this area who has kept it happy for a long period. In its native woodland habitats it seems to be dwindling away. Too often it grows in damp, mossy areas under mature conifers and logging operations change these conditions so that it cannot survive.

L. D. Hills* says to increase it by division in September or April, keeping the spring divisions in pots in a cold frame until June when they may be planted out. Plant in a moist, shady situation on leafy soil. He says cuttings come slowly but are moderately successful in June or July. We have never had enough plants or any big enough to take cuttings from them. A few of our gardening friends have been fortunate enough to find pyrolas growing in their own woodlands. Other pyrolas might be tried in such favorable situations.

The leafless members of this genus should definitely be left alone—they will not survive most garden conditions.

Rhododendron albiflorum Hook. (1834)—white rhododendron or white-flowered rhododendron—is separated from *R. occidentale* by its ten stamens and from *R. macrophyllum* by its deciduous leaves. David Leach* says *R. albiflorum*'s only close relatives are the Chinese and Tibetan species of the *Ovatum* series. This is one of the most distinct species in the genus. It grows high in the mountain ranges from British Columbia to Oregon and east to western Montana. Mr. Leach says this

species does not respond to the same cultural methods which were successful with some of the difficult Asian rhododendrons. It has a reputation for being unco-operative and the most optimistic collector will admit, ere long, that his *R. albiflorum,* though still living, is not bursting with vigor. We have one grown from seed, that puts forth new growth each year but is still without flowers, about eight years after germination. Perhaps this is another of those alpines that resents our lowland winters and misses its snow blanket. Several of those questioned have grown it from seeds but no one spoke of successful propagation from cuttings (fig. 18).

R. macrophyllum G. Don (1834). The original description of this species was published by G. Don and was from a dried specimen of a white flowered form. Later (1855) Hooker described and named the pink flowered form as *R. californicum.* Since there is only one species of rhododendron, on the West Coast, to which the two names can apply most authorities say the earlier name *(R. macrophyllum)* should be used. Dr. Hitchcock* says *R. macrophyllum* is probably hardier, and superior in some respects, to many Asiatic species. David Leach* calls this western woodland species a close ally of *R. catawbiense.* It is found along the coast from British Columbia through Washington and into the Cascades in Oregon and northern California. Mr. Sheat* gives directions for layering, grafting, and making cuttings of rhododendrons. Mr. Leach* gives exhaustive suggestions for propagating and caring for rhododendrons. We have grown this western native from seed and had more plants than we could use, even in our extensive woodland. We are hoping for some white flowered forms but none of our seedlings have bloomed as yet.

R. occidentale (T. and G.) Gray (1876)—western azalea or Oregon azalea. This species is found from the mountains of southern California north to the Umpqua Valley in southern Oregon, but probably does not reach our range. One of the finest azaleas and often used in hybridizing. Seeds germinate well and one packet of seed will give the grower a number of color forms, from white to pink. There is almost always a yellow blotch on the lower lobe of the corolla. This azalea is probably now protected from indiscriminate collecting. We have seldom seen young plants in the wild and, since seedlings begin to bloom the third or fourth year, there is little excuse to collect, even if it is legal. Zone VI or VII.

Vaccinium L.—bilberry, blueberry, huckleberry, or cranberry. Dr. Hitchcock* describes fifteen species of *Vaccinium,* some of which we have never seen growing in cultivation. Cultural and propagation methods would be much the same for any of them.

V. alaskaense Howell (1901)—blueberry. The fruit of this species has good flavor; it is found along the coast and in the Cascades from Alaska to northwestern Oregon. It is closely related to *V. ovalifolium.*

V. caespitosum Michx. (1803)—dwarf bilberry or dwarf huckleberry. Deciduous (though we have one plant that holds its leaves most winters), variable shrub that forms mats by spreading rootstocks. Seldom more than a few inches tall. Grows in meadows and on mountain slopes, from Alaska to California and east to the Rockies. Further north, on mountain slopes, to the Atlantic Coast. W. H. Preece* says it is at its best at higher elevations. When grown in full sun, it takes on brilliant tones in the fall. Someone, when asked what *V. caespitosum* needed to ensure its well-being answered, "More *V. caespitosum*". Like so many members of the Heath family, the vacciniums are gregarious and do not thrive with bare ground all around. Preece* says it is most easily increased by taking off rooted pieces, though summer cuttings will root quite readily. Seeds, though slow, are a satisfactory means of propagation. Seeds should be sown in February and handled in the same way as rhododendrons. Wilfred Sheat* advocates taking cuttings of half mature, two- to three-inch side shoots that are firm towards the base; they should be taken with a trimmed heel. (One British grower says, "Take the cuttings with a heel and cut off the toe.") Insert in compost of three parts sand, one part loam, and one part peat moss. Surface with a half inch of sand and water in well. Cover with a shaded bell jar. Royton Heath* says that, though many blueberries are found in open situations in the wild, partial shade seems necessary to keep them happy in the garden. They may be top-dressed with two inches of leafmold in early spring and in autumn. Vigorous suckers should be pinched back to keep the plants compact and well-shaped. Zone II.

V. deliciosum Piper (1901)—huckleberry. A low shrublet, 6-24 inches tall. Some authorities say it might be confused with *V. caespitosum,* though Piper* adds that it is more like *V.*

(Continued on page 126)

Rhododendron albiflorum in flower.
FIG. 18 PHOTO BY B. O. MULLIGAN

Some of Our Favorites☆

☆Won't You Send Us Yours?

Zenobia pulverulenta

ONE of our garden favorites is *Zenobia pulverulenta* which we grew from Royal Horticultural Society seed in 1956 or 1957. We grew them in the same mixture we use for rhododendrons—two parts finely sieved peat moss to one part fine sand. They germinated quickly and the little seedlings were planted in flats and spent the next two years in a cold frame. Many of the seedlings produced roundish leaves and we thought that *Lyonia* seeds might have been included in the packet, but all of these plants produced the beautiful white bells of *Zenobia* during their fifth or sixth summer. There is great variation in the leaf color as well as in the shape. Several have bluish-green new foliage. The leaves with glaucous-green blades almost invariably are more pointed than those that are yellow-green. Some have smaller corollas than others. This last summer every plant had some white bells and one was spectacular with its large, closely arranged flowers that covered six, or more, inches of the stems.

Zenobias grow rather laxly and we have found it necessary to prop the arching branches up to keep them from touching the ground. We find Douglas fir branches make good props and are more inconspicuous than cedar or bamboo grape stakes.

Zenobias may not have the beauty of form that we find in *Enkianthus* and *Rhododendron* but they have an undeniable charm that is a clue to their family identity and they look well with others of the Heath family.

PAT BALLARD

The Red Maple

One year I lived across the street from Woodland Park where all winter I had enjoyed a row of evergreen trees, a massed bank which I supposed was the boundary line of the Park. One sunny day in early March I saw a picture hard to describe. In front of the evergreens was a row of trees whose bare trunks and branches I had scarcely noticed. This day, in the sunlight, the satiny gray trunks seemed illuminated with pink and violet splashes, the twigs were red and the tree itself was decorated with clusters of dangling, bright red tassels, not unlike modern earrings. The unopened buds were several scaled, produced in threes at the end of the twigs in a distinctive pattern, the biggest bud between two small ones forming another jewel-like ornament of bright, shiny crimson. Rutherford Platt says, "This crimson trident of the red maple is one of the brightest of tree gems." The beauty of the whole tree is, indeed, a Heaven-sent spring blessing.

In a general way all maple leaves resemble each other but, as everyone knows, each variety has its own peculiar earmarks. The red maple leaves have from three to five lobes that point forward. The cut between the lobes, the sinus, is fairly shallow and pointed at the base, making its own facial expression. The sugar maple leaf, the one Canada chose to be its emblem, is built on the same lines but with larger lobes and the sinus is rounded at the base.

The uses of red maple trees in a garden, large or small, are many. For one single tree primroses make a charming ground cover. One year I tried snowdrops because they bloom at the same time, but the contrast of the pure white and the brilliant red seemed too strong, there was no subtlety. However, there is a challenge to everyone with a red maple to make a picture that is never forgotten and which may repeat itself every year when there is little else to compete with its beauty.

GRACE T. DOWLING

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The Arboretum Bulletin

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To keep memberships in the Arboretum Foundation in good standing, dues should be paid during the month payable. Active memberships more than three months in arrears will be dropped and THE BULLETIN will be discontinued.

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I hereby apply for membership in the Arboretum Foundation and remittance for same is enclosed to cover dues for the next succeeding 12 months.

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For Those Who Will Listen

A walk in the Arboretum gives a quiet answer to one of the questions posed so crucially, and cruelly, last weekend with the death of President John F. Kennedy.

What does this stricken nation do now, faced with the loss of its leader?

A look along the forest pathways, where towering, stark trees have cast their leaves upon the ground, shows us already the great, continuing life-impulse making itself felt in the thrust of new buds on the magnolias. For the whole nation, sickened and ashamed that it could harbor such lawlessness and violence as brought about the tragedy, there seemed to be a portentous pause and a darkening; but here under the trees the miracle of continuing life goes on, enriched by all that has gone before. Here under a grey sky all the multitudes of greens and russets and browns are brought into a oneness, and so it must be with our country.

At the head of a glen one hears a small stream running between the stones. From the far edge of the parkland come the swelling, ominous sounds of the city; but for those who will stand and listen, the ancient wisdom of water finding its way to an inevitable destiny fills the heart with hope and courage.

M. C. GRAY, in *The Argus*,
Seattle, November 29, 1963,
reprinted by permission.

Hermaphrodite Cottonwoods?

The native black cottonwood, *Populus trichocarpa*, T. & G., is commonly regarded as a dioecious species, that is, it carries male and female flowers on different trees. In an attempt to determine the mechanism responsible for the sex difference a search is currently being conducted for the natural occurrence of hermaphrodite individuals. The hermaphrodite condition can be recognized by the observation of: (1) both normal male and normal female catkins occurring on the same tree; (2) individual catkins that are partly male, partly female; (3) individual catkins containing bisexual flowers.

In the Seattle area, flowering of black cottonwood can be expected any time between late February and April.

Information regarding the occurrence of hermaphrodite trees should be addressed to Dr. R. F. Stettler, College of Forestry, University of Washington, Seattle 5, Washington, telephone 543-2730.

This is your Arboretum, kept alive by your support

We are pleased to welcome the following new members (September 11 through December 31, 1963): *Life* — Mrs. Raymond D. Ogden. *Sponsor* — Northern Commercial Company, Pioneer Sand & Gravel Co. *Supporting* — Olympic Brewing Co. *Sustaining* — Mr. and Mrs. Beecher Blake, Mrs. Gordon Gabie, Lake Meridian Garden Club, Oak Harbor Garden Club, Mr. and Mrs. Robert E. Perdue, Edward S. Soper, Terra Tillers Garden Club, Terrace Ridge Garden Club. *Annual* — Mrs. Vincent G. Albert, Mrs. Thomas C. Allison, John W. Bell, Mrs. Kenneth M. Bero, Mrs. W. Howard Boom, Mrs. E. W. Bostrom, Mrs. George B. Brimhall, Mrs. Donald B. Brown, Jr., Mrs. Rose M. Carleton, Mrs. Elbert E. Cary, Mrs. Philip P. Chase, Mrs. Robert A. Chervenak, Petric Cirila, Mrs. N. M. Clark, Mrs. E. R. Clarke, Jr., Mrs. D. K. Clawson, Mrs. Chalmer K. Cook, Mrs. Burton W. Cornwall, Mrs. C. C. Donovan, Mrs. Elizabeth W. Draper, Mrs. John E. Dunn, Mrs. Fred Frederickson, David L. French, Mrs. E. H. Gibson, Mrs. Raymond Gregor, James Griffin, Mrs. G. O. Gunderson, Mr. and Mrs. Robert E. Hall, Mrs. Ralph Hastings, Mrs. Donald Hugh Hedges, Mrs. R. J. Helberg, Mrs. E. J. Hendrickson, Mrs. R. H. Herrick, Mrs. A. J. Holden, Mrs. W. M. Hollerbach, Mrs. Robert L. Jackson, Mrs. George A. Jahant, Mrs. James T. Johnson, Mrs. J. Clifton Johnson, Mrs. Robert E. Johnson, Mrs. J. F. Kunesh, Mrs. Wm. E. Kuyatt, Mrs. S. L. Lake, Mrs. George D. Leonard, Mr. and Mrs. Newton P. Lesh, Mrs. Glenn H. Lewis, Mrs. Warren W. Lyons, Mrs. Clyde P. Matteson, Mrs. E. L. May, Mrs. Harry V. Meade, Mrs. Evelyn Metcalfe, Mrs. George H. Miller, Mrs. L. Joe Miller, Mrs. E. R. Moffatt, Mrs. J. R. Moorehead, Mrs. John R. Moran, Mrs. Charles E Newschwander, Mrs. S. M. Olson, Mrs. Henry Oman, Mrs. Richard M. Oswald, Mrs. Walter S. Parks, Mrs. Keith E. Pickrell, Mrs. Louise E. Ritter, Mrs. Wm. H. Ritzheimer, Mrs. Charles J. Roberts, Barbara Rutledge, Mrs. John N. Ryder, Mrs. George A. Saunders, Mrs. Clifford H. Sayre, Mrs. Anton J. Schwarz, Mr. and Mrs. F. J. Scott, Mrs. Howard E. Snyder, Mrs. Norman Stansbery, Mrs. Orion D. Starr, Mrs. John C. Storey, Mrs. Hugh D. Stuessi, Mrs. A. J. Swanson, Mrs. Henry E. Swanson, Wm. H. Switzer, Mr. and Mrs. J. T. Tallackson, Mrs. Louis Toppano, Mrs. Gerard Vaness, Mrs. Kenton G. Van Nortwick, Mrs. Frank Vert, Mrs. Arlene Warner, Mrs. Dorothy R. White, Mrs. John W. White, Arthur Widahl, Mrs. James W. Will, Mrs. Laurence Wylie, Mr. and Mrs. Robert L. Zesbaugh, Mrs. Harold S. Zimmerman, Mrs. George W. Zoll.

We are also most grateful to the following members who have increased their dues to: *Contributing* — Continental, Inc., Mrs. Wm. McKay Davis, Mrs. George H. Weyerhaeuser. *Sustaining* — Mrs. Herbert W. Blackstock, Mrs. Simon T. Cantril, Mrs. W. G. Hiltner.

In Memoriam

During the past few months the Arboretum Foundation, and the Arboretum, has lost two stout-hearted supporters in the persons of Mrs. Elizabeth H. Hanley, of Central Point and Medford, Oregon, and Mr. Carl M. Ballard of Seattle, who died November 15, 1963, after a long illness.

Mrs. Hanley was a member of the Editorial Board of our *Bulletin* for three years, from 1948 to 1951, while living in Seattle; then Oregon member from 1951 to the end of 1954. We well remember her sprightly manner, lucid ideas and pertinent suggestions at Board meetings. Too seldom did she contribute to the pages of the *Bulletin*, and when she did it was always concerned with her favorite plants, Japanese cherries and lilacs (see issues for Summer 1947, Spring 1953, and Summer 1954) which she grew and displayed so well in her own garden. On the rarer occasions in recent years when Mrs. Hanley came to Seattle she invariably visited the Arboretum office in company with Mrs. O. B. Thorgrimson and Mrs. F. A. Bunge; we shall miss these visits, her ready smile, quick wit and truly gracious manner.

Mr. Ballard was elected President of the Arboretum Foundation in the fall of 1955 and served for two years, being re-elected a year later.

He will be especially remembered for the prominent part he played in the long fight against the proposal to build the second Lake Washington bridge from Evergreen Point to Montlake, through the north end of the Arboretum, which was then at its height. Even though the battle was lost in the end, a great effort was made by Carl Ballard, Donald Graham and many others at that time and subsequently to save the Arboretum; he, and they, will be gratefully remembered for it, but we also like to think of his cheerful greeting whenever he came to see us, and of the continuing interest he showed in Arboretum affairs even when no longer President of the Foundation.

Another whose passing on June 3, 1963, we also record with sadness at this time was Rudolph Henny, of Brooks, Oregon, rhododendron breeder for more than a quarter century, editor of the American Rhododendron Society's publications since 1948, a lover and grower of good plants and a skilled propagator. The October 1963 issue of the A.R.S. *Quarterly Bulletin* contains full accounts of his life and achievements, by a number of his friends, and includes a list of the eighty-two hybrid rhododendrons which he raised and named between 1947 and 1963. A note by him on the use of 'Bow Bells' as a parent was published in our *Bulletin*, Spring 1961.

The Arboretum collections have been enriched by gifts of scions of several of his rhododendron hybrids,—in 1958, 1960 and 1961,—and by plants of four Japanese cherries received Feb. 1963. These beautiful trees were his second love in the plant world and we were able to exchange propagating material with him, to our mutual advantage.

To the relatives of all these good friends of the Arboretum we offer this tribute to their memory and wish to express our most genuine sympathy.

B. O. M.

BOOK REVIEWS

Woody Flora of Taiwan, by Hui-Lin Li. Morris Arboretum, Philadelphia, and Livingston Publishing Company, Narberth, Pennsylvania. 992 pages, cloth, (1963). Price $18.75.

A FLORISTIC treatment of the vegetation of some far-off place gives wings to the imagination. It stimulates armchair plans for plant exploration and brings dangerous thoughts of schemes to secure many of the described plants for one's garden, park, or arboretum. Just such a book is Dr. Li's. Though a thoroughly scholarly account of trees, shrubs and vines of Taiwan (Formosa), by picture and by description, the plant explorer as well as gardener and horticulturist will find much to tempt him.

Taiwan is at the botanical crossroads of eastern Asia. Elements of several floristic regions converge on this large island. Plants of Philippine, Oceanic, Malaysian, Chinese, and Japanese affinity occur on Taiwan. Often these representations are even the same species, but as well, the island harbours many endemic species in genera known from beyond Taiwan's shores. A major factor in the tremendous floristic diversity of the island is the north-to-south trending mountain system, which "bristles with numerous high peaks forty-eight of which are over 10,000 feet in height". These are "the loftiest mountains between the Himalayas and the Sierra Nevadas in California." No wonder that the island boasts nearly 4000 species of flowering plants and ferns, many of them woody species.

For the temperate zone plantsman, temptation for plant introductions from Taiwan must be restrained. Taiwanian woody species that range from 6000 feet upward are probably the only ones likely to prove hardy, and many of these only doubtfully so. Yet this is not too severe a limitation. As a teaser, I can list some of the families and genera which contain promising or proven horticultural plants: Conifers in the genera *Taxus, Cephalotaxus, Pinus, Abies, Pseudotsuga, Picea,* and *Taiwania;* the oak and barberry families, *Hydrangea,* the witchhazel and rose families *(Corylopsis, Liquidambar, Sycopsis, Photinia, Prunus, Rosa, Stranvaesia),* the holly, maple and camellia families, and of course, the *Ericaceae (Gaultheria, Pieris, Rhododendron,* and *Vaccinium).*

The "Woody Flora of Taiwan" will surely have to be in all botanical libraries and on the book shelves of specialists. Its author, Dr. Hui-Lin Li, of the staff at the Morris Arboretum in Philadelphia, is a recognized authority on the flora of eastern Asia. His present contribution will be valued for its excellence of taxonomic erudition, of description, and of illustration. And those less-than-specialists will want to enjoy the experience of glancing through the richly illustrated volume; theirs will be the knowledge that the book exists for the time when they may need information on horticultural plants introduced from "Ihla Formosa" ("beautiful isle") as the Portuguese named the island of Taiwan.

A.R.K.

The Origin and Cultivation of Shade and Ornamental Trees, by Hui-Lin Li. University of Pennsylvania Press, Philadelphia; illus., 282 pp. (1962). Price $6.00.

AT one time or another all gardeners have speculated about the origin of various ornamental trees and shrubs used in their own gardens, or seen in their own neighborhood or their travels. In many cases such stories are of great interest and involve many aspects of human activity.

Dr. Hui-Lin Li, taxonomist of the Morris Arboretum in Philadelphia, is well equipped and admirably situated for the task of presenting this subject. He notes the early beginnings of man's interest in ornamental cultivation of plants and documents some of the earliest records of such interest. With this as a foundation he traces the origins—historical, geographical, botanical and horticultural—of various tree species. The information concerning *Ginkgo biloba* and *Metasequoia glyptostroboides* was of particular interest.

The book is interestingly and pleasantly written, as well as being factual, and is one which surely will be of interest to many amateur as well as professional gardeners.

C. Frank Brockman

Meet Flora Mexicana, by M. Walter Pesman. The Dale Stuart King Publishing Co., Globe, Arizona (1962). Price $6.00 hard cover; $4.00 paper cover.

DURING my travels throughout the Republic of Mexico, I have frequently come in contact with many "friends of the flowers" who have greatly deplored the fact that, up to this time, there was no comprehensive or easy-to-carry guidebook available in English, that would accurately describe and identify the imposing and vividly colorful plants, trees, and shrubs of that country.

It is gratifying to learn, therefore, that quite recently there has been published an extremely useful book of this nature. *Meet Flora Mexicana,* is an unique and educational contribution to this long felt need.

The author, a most capable and understanding botanist, spent years of travel and research in Mexico, and his profusely illustrated volume not only clearly identifies most of the spectacular plants and trees, but at the same time provides the ecological classification of the various zones in which they are found.

More than a thousand specimens, ranging from the desert cactus to the ever exotic and glamorous orchids of the jungle have been delineated.

He has lavishly embellished every page with a flawless and accurate drawing of the subject outlined, and in arranging the vegetation in zones on the order of a regional directory, classifies his material accordingly with definite clearness and charm.

To demonstrate this excellent idea, he has compiled a colorful and detailed foldout map in the front of the book. This map provides a key to the plant material in the zone in which one finds oneself, and proves incalculable in its simplicity in checking identifications.

Rainfall figures as a large factor in the sea-

sonal periods of plant life in Mexico. For this reason the author has divided his classifications into pertinent zones, such as the Desert zone, recognized by various cactus, yuccas, and large fields of creosote bush, and merging with this, and almost as dry as the desert, the Mesquite or Grassland zone.

Here hundreds of thorny, straggling mesquite bushes abound. Many long-stemmed white yuccas *(Yucca elata)* are prevalent, as are the yellow-flowered palo verdes *(Cercidium microphyllum)*, *Argemone ochroleuca*, and hundreds of *Buddleia sessiliflora* cover the area.

Many evergreen sumacs *(Rhus sempervirens)*, the colorful Hummingbird Flower *(Loeselia mexicana)* and the gray-green *Agave Parryi;* ocotillo and organ pipe cactus are here, as are countless other highly colored desert flowers which intermingle with the low-growing junipers and scrub oaks in this zone.

The Short Tree or Thorn forest category covers some of the most beautiful flowering trees in the world. He graphically describes the many radiant-hued acacias; *Acacia cymbispina, A. gladiata, A. Hindsii*, and the well-known *Acacia Farnesiana* and *A. cornigera* are among them. In this zone there are the morning-glory trees *(Ipomoea murucoides)*, *Cassia oxyphylla, Caesalpinia cacalaco*, and many giant cactus of the *Pachycereus* group.

Most inspiring to me, perhaps, is his description of the Pine-Oak forest. This classification, of course, covers a large hilly and mountainous area well above the five thousand feet locale.

There are more than one hundred and twelve different species of oaks in Mexico, and better than twenty-six kinds of pines.

I long had been intrigued with a very lustrous looking pine that resembled in a measure the famous Montezuma pine, but differed in that it had very slender, delicate branches and drooping tassel-like needles, probably six or eight inches long. The author classifies this as *Pinus patula*, or the Jelecote pine, and states that it later develops extremely dainty and exotic little cones.

Other pines of interest described are *Pinus teocote*, or the Pine of the Gods; the sacred fir of the boreal forest, *Abies religiosa*, and, of course, the outstanding, picturesque and always imposing Montezuma pine of early historical fame.

In conclusion, I predict that this practical handbook and guide will have a very fine distribution, not only in this country, but in Mexico itself, for the very convenient plant register and excellent two-page bibliography at the back of the book will be of intrinsic value not only to tourists, but to all those who are interested in tropical flora.

EDITH H. BANGHART

Bonsai-Saikei, The Japanese Miniature Trees, Gardens, and Landscapes. Toshio Kawamoto and Joseph Y. Kurihara. Nippon Saikei Company, Tokyo, Japan, 1963; price $30.00.

THIS is a marvelous book for the bonsai enthusiast to own. It has 360 pages with many color plates, black and white illustrations, drawings and sketches. It covers every phase of bonsai culture. The sketches in particular are clear and concise. They should be of value to anyone interested in pruning, wiring or planting bonsai.

A large portion of the book is devoted to the making of Saikei. These are miniature landscapes and use younger trees to produce charming scenes quickly. This should appeal to those who don't relish waiting ten years to see results. It is amazing to see how seedling trees, rocks and mosses can embody the feeling of an exquisite scene. As the authors point out, at the end of ten years you can promote a particularly beautiful scene or tree into the class of bonsai.

A chapter I found particularly interesting was one on "How to Beautify Ugly Trees." Many trees have one poor feature that prevents their use, even though the rest of the tree is good. The sketches here were very helpful. The book also has the most detailed description of rock planting I've seen. The pictures accompanying this chapter are very informative. The book itself is beautiful and a delight to read or browse through.

CONSTANCE RAPHAEL

NOTE: Anyone wishing to order a copy of this book should do so through the Arboretum Foundation office, since there will be a 40% reduction in cost for group orders.

Mrs. R. S. Harvey

On the afternoon of Labor Day, September 2, 1963, four members of the R. S. Harvey family (Tacoma, Wash.) picnicked on one of the ocean beaches, then entered their small plane and rose into the low-hanging fog banks. They are presumed to have been lost at sea.

Mrs. Harvey, skilled Tacoma horticulturist, lecturer and flower arranger, had been an active member of Helen Janeck Arboretum Unit No. 36 for many years. Her enthusiasm and her knowledge of rare and unusual plants contributed richly. Her own beautiful garden was opened many times during each year for educational tours for garden clubs and other horticultural groups.

CLARA E. GOERING (MRS. W. H.)
Member Helen Janeck Arboretum
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Dwarf Conifers in the Strybing Arboretum

(Continued from page 104)

Chamaecyparis obtusa 'Ericoides', an extremely rare fixed juvenile form first imported from Yokohama in 1894. The stiff, narrow foliage is a lovely glaucous grey-blue color in summer, but in winter takes on the color of a crimson plum.

C. obtusa 'Nana', the true form of this extremely slow growing conifer is quite rare and many other plants masquerading under this name are to be found in the trade. Its foliage is very dark and dull green. A 60-year-old specimen in a Dutch nursery measured 7 inches in height and 24 inches in diameter.

C. obtusa 'Nana Kosteri', a dwarf, compact, umbrella-like plant having brownish-green foliage curiously twisted into cup-like sprays. Originated in the nurseries of M. Koster & Sons, Boskoop, Holland.

Chamaecyparis pisifera 'Plumosa Nana Aurea', a slow growing, low, compact bun-shaped cushion having light golden-yellow foliage. Its annual growth is about 1 inch.

Cryptomeria japonica 'Globosa Aurea Variegata', this compact, round-topped bush has leaves on the same branchlets of two different colors. Some are green and others are pale yellow giving the plant a sort of "salt and pepper" appearance.

Cupressus macrocarpa 'Lilliputian', a dwarf and compact shrub 12 inches high and 18 inches in diameter. Raised by the nursery in Golden Gate Park about 1947 from seed collected from a normal tree. The leaves are dimorphic; the lower leaves are in four ranks and awl-shaped while those at the tips of the branches are adpressed and scale-like.

Juniperis chinensis 'Plumosa Aurea', an attractive form of an unusual bronze-gold color having arching branches somewhat like the plumes of pampas grass.

Pinus nigra 'Hornibrookiana', raised from a "witches broom" found in an Austrian pine in Seneca Park, Rochester, New York. A low shrubby plant having stout ascending branches covered with stiff, sharp-pointed dark green needles.

Pseudotsuga Menziesii 'Densa', an extremely dwarf, flat-topped form with shorter dark-green leaves than the type and having matted horizontal branchlets.

Taxus baccata 'Nutans', a tiny, sparsely branched, slow growing yew forming an irregular bush and having dark-green foliage of various sizes. Portions of some branchlets are apparently bare, but on close examination will be found to be covered with tightly adpressed, heath-like leaves barely 1/8-inch long.

A display of such a fine collection of dwarf conifers in the public gardens of the Arboretum is a stimulation to the return of these plants to their former popularity. They are perhaps especially appealing because of their size which makes them adaptable to the restricted spaces within the city garden. They require little care, and if planted in the right location to begin with, they will flourish for many years to come. Their value as foundation plantings is proven. The enjoyment of the search for new cultivars is not to be overlooked, and the results of such a find will always be of interest and delight.

Tree and Shrub Pruning

(Continued from page 107)

PEACH TREES. Peach trees should be pruned about one-fourth of old wood, that is, bearing wood. The flower buds are borne on one-year-old branches, in threes. The outer two buds, with little furry tips, are fruit buds, while the one in the center is a leaf and bud shoot. All cuts should be made above a leaf bud. A peach tree should be pruned each year to bring about the development of one-year spurs and shoots. Pruning should be done to expose as much leaf surface as possible to the sun. Peach trees should be pruned after the danger of heavy freezing has passed.

PLUM TREES. Pruning of plum trees should be very slight, as a severe pruning will bring about an overabundance of sucker growth. A light pruning at the crown will usually suffice.

PEAR TREES. Pears require slight pruning, mostly the water sprouts. If heavy pruning is required, prune the same as for apples.

SHRUBS. The purpose of pruning shrubs is to keep their natural growing habits and shapes within the limits of their surroundings.

All shrubs are not to be pruned at the same time. Some require pruning in the winter, some in the spring and others in the summer, after they bloom. For instance, the rhododendron should be pruned after it has bloomed. This is one shrub that most people think should never be pruned, regardless of how leggy and top-heavy it may become. By pruning a rhododendron back after blooming you are giving it a chance to put out new growth from the dormant buds that will bloom the following year. However, under average soil conditions the pruned branches will only set leaf buds the first year and bloom buds the second season.

When flowers of shrubs are of no consideration, the pruning may be done in early spring. This produces early growth which will cover up the pruned area. Regardless of what time of the year it is done all dead, diseased and broken branches should be removed and the pruning cuts painted with a good wound dressing.

An Appraisal of Small Ornamental Trees in the Garden

(Continued from page 101)

the opposite direction. It has grown to about 12 ft. since 1955, planted in light clay soil with moderate summer watering. Last winter a bright sun in freezing weather badly scorched the tough, convex, deep-green, holly-like leaves.

Quercus phillyraeoides, from Japan and China, is, perhaps, the most graceful and usable oak of the three with thinner, glossy, bright green leaves that are bronzy in the spring. It does not form a strong single trunk, and branches are less stiff than are those of most evergreen oaks. The lower branches are pendulous, clothing the tree to the ground.

Planted as a young specimen in good soil, but out of reach of the hose it has grown to 10 ft. high and 3 ft. wide in ten years, has suffered no frost damage, and appears to have thrived on neglect. This tree, or large shrub, merits a more prominent place in the garden than we have given it. We have had fair success in rooting summer cuttings of this tree.

Umbellularia californica — The Laurel tree from southern Oregon and northern California coastal regions. Fifteen years ago this evergreen tree was planted with several hemlocks on the back property line in a partially shaded location in good topsoil. It has grown 18 ft. tall and 10 ft. wide, and the strongly aromatic, two- to five-inch leaves, that are deep-green, make an attractive contrast with the hemlock. A very satisfactory screen planting and background for flowering plants.

Eucryphia glutinosa — This flowering tree from Chile is often classified as semi-evergreen, but in our garden it is evergreen throughout the year. This species has a number of characteristics that make it a valuable landscape subject: it doesn't take up much room in the garden with its narrow, upright, multi-stemmed habit of growth; the dainty, pinnate foliage combines well with broad-leaved evergreen shrubs (a restricted root zone and the same cultural preferences make this combination possible) and its exquisite, white, cup-shaped flowers are doubly welcome in August. Our tree, which was planted in 1953, has been completely hardy. About thirteen years old, it has grown to a height of 15 ft. and width of 6 ft. in light clay soil.

Last year the *Eucryphia* flowered for the first time—just two blooms—so we anticipated a better show this year. Instead, there was none. Perhaps this is the nature of the plant when it first reaches flowering age, or the season wasn't conducive to bud-set. We suspect it needs more water than it has received in late spring and early summer when buds should be forming.

The tree provides its own shade, with its lower branches touching the ground. While the growth has been rapid under fairly dry conditions, it is not lush, and the new growth hardens off well in the autumn.

Northwest Members of the Ericaceae

(Continued from page 118)

ovalifolium in its floral characters. Szczawinski* says it should be treated as a variety or subspecies of *V. caespitosum.* Many mountain visitors say it has the sweetest, most palatable fruits of the genus. Notable also for its bright red fall coloring. Zone V.

V. globulare Rydb. (1900)—blue huckleberry. Deciduous shrub, from six inches to two or more feet tall. Eastern Washington and Oregon to Montana and Wyoming, in the mountains, at lower and middle elevations. Closely related to *V. membranaceum,* having similar serrulate leaves.

V. macrocarpon Ait (1789) — common cranberry. This native of eastern North America occasionally escapes from cultivation and has established itself near the coast of Washington. Zone II.

V. membranaceum Dougl. ex Hooker (1834)—mountain huckleberry. Fruit usually purple or dark purplish red, though occasionally red fruited plants are found. Found on mountain slopes, British Columbia to northern California, east to Montana and Idaho. Fairly common on both sides of the Olympics and Cascade mountains. Zone V.

V. myrtillus L. (1754)—dwarf bilberry. Hitchcock* says this is similar to *V. scoparium,* but its flowers and leaves are somewhat larger, it has fewer branches, is more often pubescent, and the fruit is a dark red to a rather bluish berry. Found from Alberta to New Mexico, west to British Columbia and south, on the east side of the Cascades, to the Wenatchee Mountains; also in Eurasia. Zone VII.

V. occidentale Gray (1880)—western huckleberry. Differs from *V. uliginosum* in its glabrous stems and slightly smaller berry.

V. ovalifolium Smith (1817) — blueberry. A spreading deciduous shrub, four to forty inches tall. Flowers before the leaves reach their mature size. The fruits are drier and not as acid as *V. alaskaense* but have a good flavor. Alaska to Oregon in the Cascades and east to Montana; also in eastern United States and in northeastern Asia. Zone V.

V. ovatum Pursh (1815)—evergreen huckleberry. Dr. Hitchcock* says that some of these ornamental shrubs have reddish-brown fruits that are not as juicy as the blackish ones. Wilfred Sheat* suggests layering late in the summer or in the fall. Mansfield* says to take cuttings in July. We have grown it from seed sown in February. Dr. Hitchcock* says its ultimate height may be as much as four meters (13 feet) though in many areas it is only two to three feet tall. Found from the west side of the Cascades to the coast, from British Columbia to the redwood area of California and occasionally as far south as southern California. Zone VII.

V. oxycoccus L. (1753) — wild cranberry. A creeping shrub, with thin, wiry stems and shiny, evergreen leaves, distinctive pink flowers and red fruits. It is usually found in sphagnum bogs from eastern Canada to Alaska, and south, in the west, to Oregon and Idaho; also in Eurasia. Dr. Hitchcock* mentions two varieties of this species; var. *intermedium* Gray, with larger leaves and petals and, usually, puberulent pedicels, and var. *oxycoccus,* which usually has small leaves and petals and glabrous pedicels. Zone II.

V. parvifolium Smith (1817)—red huckleberry. Deciduous, but some leaves may be persistent. Bright red, rather sour fruits are enjoyed by birds, animals and man. Good fall color in a sunny situation. Attractive with or without leaves; the leafless branches are often used in flower arrangements. Found from southeastern Alaska to central California, on the west sides of the Cascades in our area. Mansfield* says to take cuttings in July. Zone V.

V. scoparium Leiberg (1897)—grouseberry or whortleberry. A deciduous, alpine shrublet, with yellow-green leaves and stems, yellowish-pink flowers and small red fruits. Found in the Hudsonian Zone, often forming extensive colonies, from British Columbia to Northern California, east to Alberta and South Dakota, south in the Rockies to Colorado. We have collected plants that lived but put forth no leaves for the first year or two. One collected plant flowered and fruited for us this year. Zone V.

V. uliginosum L. (1753)—bog blueberry. Deciduous shrub to twenty inches. Grows in bogs along the coast from Alaska to northern California, east in Canada to the Atlantic Coast, and in Eurasia. Zone II.

As always, new information, even about native plant material is constantly coming to notice. This summer (1963) *Loiseleuria procumbens* was collected in northern Washington. It had been found so far south in British Columbia that it is no surprise but this is the first positive record.

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Arboretum Plant Collections

(Continued from page 115)

P. Strobus 'Pendula'
Plant from R. Marshall, Wethersfield, Conn., 3/57.

'Pumila'
Scions from Wm. Gotelli, South Orange, N.J., 3/59.

'Umbraculifera'
Scions from Wm. Gotelli, as above.

P. Sosnowskyi Nakai (1939)
Botanical Garden, Tbilisi, U.S.S.R.; sd., 6/60.

P. taiwanensis Hayata (1911) Taiwan
Taiwan Forest Admin., Taiwan; sd., 3/58.

P. Thunbergii 'Oculis-Draconis'
H. J. Hohman, Kingsville, Md.; two plants, 4/60.

HYBRIDS

P. X Hunnewellii A. G. Johnson (1952) (*P. Strobus* X *P. parviflora*)
Scions from V. McNitt, Campobello, S.C., 2/59. Coned 1962. Nat. origin at Wellesley, Mass.

P. X Schwerinii Fitschen (1930) (*P. Griffithii* X *P. Strobus*)
Plant from H. J. Hohman, Kingsville, Md., 3/62.
Orig. on estate of Graf von Schwerin near Berlin, Germany.

'Mercury' (*P. Griffithii* X *P. parviflora*)
Nat. origin at Morris Arboretum, Philadelphia.
Morris Arboretum, scions, 2/63.

P. ponderosa X P. Montezumae
Scions from Inst. of Forest Genetics, Placerville, 2/58.

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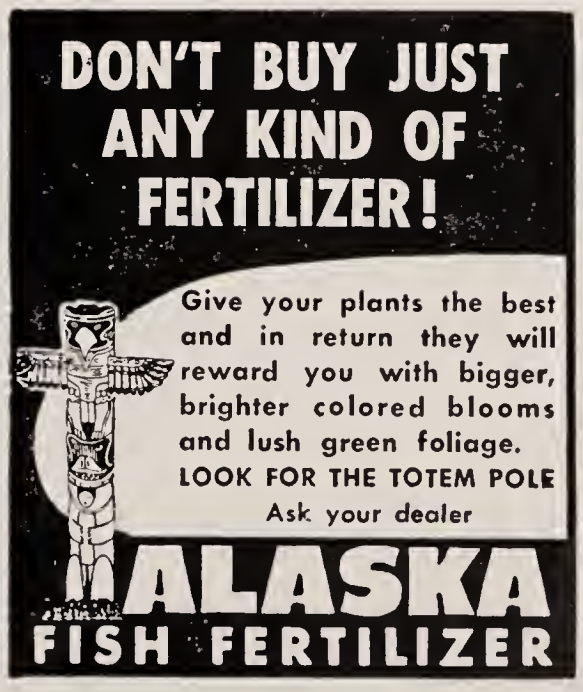

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Plant Collections in the Univ. of Wash. Arboretum

(Continued from page 106)

Boulevard; nineteen species and varieties, with seven hybrids or clones.

Japanese *(A. japonica)* and Italian alders *(A. cordata)* have been noticeably rapid in growth; *A. glutinosa* 'Imperialis', with its finely cut foliage, the most attractive.

12. *Arctostaphylos* Manzanita

Generally successful here if placed on sunny banks in sandy soil; sixteen species and ten clones or hybrids are cultivated. Some others were lost in the 1955 freeze.

A. canescens, A. Andersonii var. *auriculata, A. Manzanita* and *A. Stanfordiana* have been outstanding in growth, appearance and hardiness.

13. *Ceanothus*

These also have been placed in similarly well-drained and sunny locations, but as a group are generally less hardy than the *Arctostaphylos,* perhaps more equivalent to the *Cistus.*

A number of species and hybrids have had to be replaced after cold winters. At the present time twelve species and fifteen hybrids or clones are growing here. *C. impressus* 'Puget Blue' has been selected, tested in California as well as locally, and introduced to nurseries and gardens.

14. *Eucalyptus*

This genus has provided a challenge for more than twenty years, during which period a considerable number of species from S. Australia and Tasmania have been planted and tested in a well-drained, sandy type of soil. Many were eliminated by cold in November 1955 but fresh plantings were subsequently made. Thirteen species are now to be found here and a fresh importation of seeds has recently been received from Tasmania.

From our experience the hardiest appear to be *E. coccifera, E. Gunnii, E. niphophila,* the snow gum. The tallest with us is *E. Dalrympleana,* 25-30 feet in height after eight years growth, but it suffered considerably in the winter of 1962-63.

15. *Juniperus* Junipers

A very varied assortment is being grown, from tree types to prostrate shrubs. Total number, about fifteen species, forty clones, chiefly of *J. horizontalis* and *J. scopulorum,* the Rocky Mountains juniper.

J. phoenicea and *J. thurifera,* from southern Europe, are well established; *J. Cedrus,* from the Canary Islands, and *J. procera,* from east Africa, have been tried and lost in cold winters. *J. squamata* var. *Fargesii* has been with us since 1937; *J. communis* var. *Jackii* was introduced from the Siskiyou mountains of southern Oregon in 1955.

16. *Vaccinium*

Twenty seven species are cultivated, the smaller in a lath house, the larger plants associated with rhododendrons.

NOTE: Lesser collections are maintained of *Buxus, Betula, Euonymus, Hydrangea, Styracaceae,* and the coniferous genera *Abies, Larix, Picea and Tsuga.* It is hoped to publish a complete catalogue of our plant collections within the next year or two.

B. O. M. & J. A. W.

R. yakusimanum grown from seed collected on Mt. Huna-No-Ego, Yakushima

These two-year plants show many interesting leaf variations but all have the true indumentum on underside of leaf. This leaf variation has been noted by those observing plants grown in the wild. Fine pink forms are said to exist. These should grow to interesting and unusual plants. Listed in our catalog. Quite new, seldom offered is the Le Pinac form of *Kalmiopsis leachiana,* a rare and beautiful Northwest alpine shrub. Not listed in our catalog but now available. Write for information. This better form of *Kalmiopsis* is much easier to grow than the original form, and forms a compact rounded mound with fine pink flowers. New 1964 catalog now available, illustrated, listing 40 pages of fine plants.

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